Journal of Gas Lighting, Water Supply, and Sanitary Improvement."—Oct. 31, 1916.—Registered as a Newspaper.

JOURNAL OF GAS LIGHTING AND WATER SUPPLY

UNIV. OF MICH. LIBRARY Chemical Lib.

Vol. CXXXVI. No. 2790.] LONDON, OCTOBER 31, 1916. [68th Year. Price 6d.

O'NEILL'S
OXIDE
GAS PURIFICATION & CHEMICAL CO., Ltd.
PALMERSTON HOUSE, LONDON, E.C.
Telegrams: "PURIFICATION, LONDON."
Telephone: 9144 London Wall.

"TORBAY PAINT."
FOR ALL PURPOSES.
The TORBAY PAINT CO.,
26, 27, & 28, Billiter St., London, E.C.
39-41, Old Hall St., Liverpool.

EDWIN LEWIS & SONS,
Britannia & Patent Tube Works,
WOLVERHAMPTON,
LONDON & LIVERPOOL.
E. L. & S.
TUBES & FITTINGS.

WM. F. RUSSELL & SONS.
GAS & CANNEL COAL CONTRACTORS.
Telegrams for all Offices: "MONKLAND."
GLASGOW: 90, Mitchell Street;
NEWCASTLE: Exchange Buildings;
HULL: Exchange Buildings, Lowgate;
LIVERPOOL: 5, Castle St.; &
SWANSEA: Atlantic Buildings.

R. & W. HAWTHORN LESLIE & CO., LTD.
In Stock.
TANK LOCOMOTIVES
Always In Progress.
Locomotive & Marine Engineers & Shipbuilders,
NEWCASTLE-ON-TYNE.

INTERMITTENT VERTICALS.
Adopted all over the World.
Vertical Gas Retort Syndicate LTD.,
17, VICTORIA ST., WESTMINSTER, S.W.
See Advertisement Oct. 10, p 58.
Sole Agents for Australasia—
JAMES HURLL & CO., LTD., SYDNEY.

W. PARKINSON & CO.
(Incorporated in Parkinson and W. & B. Cowan, Ltd.),
LONDON & BIRMINGHAM.
(See Advertisement p. 214).

JAMES McKELVIE & CO.
Coal Owners,
Cannel and Gas Coal Contractors,
17, RUTLAND SQUARE, EDINBURGH.
59, MARK LANE, LONDON, E.C.
Telegrams: "Mackelvie, Fen. London."
Telephone: Avenue 2177.
GUILDHALL CHAMBERS, SANDHILL, NEWCASTLE-ON-TYNE.
24, CHAPEL STREET, LIVERPOOL.
VICTORIA BUILDINGS, BUTE DOCKS, CARDIFF.
Prices and Analyses of all the Principal Cannel, Gas, and Steam Coals forwarded on application.
ESTABLISHED 1840.

STEWARTS AND LLOYDS, LIMITED, 41, OSWALD STREET, GLASGOW. BROAD STREET CHAMBERS, BIRMINGHAM.
TUBES & FITTINGS for Gas, Steam, Water, &c.

"Extremely Accurate and Well Made"
aptly describes George Glover's Dry Gas Meter. Giving "correct" registration at all outputs and at varying pressures, it will be found satisfactory under the most trying conditions. Every meter leaving their works, irrespective of size—and they build up to 3000 lights—is regulated and tested for soundness at 12-in. pressure, and for registration not only at the ½-in. pressure prescribed by the "Sales of Gas Act," but at 3-in. pressure with full outlet capacity so as to prevent slow registration even when the Meter is overworked. Since 1861 the
George Glover Dry Meter
has gained the highest awards at the principal International Exhibitions and to-day represents the ideal gas recorder.
PARTICULARS AND PRICES ON APPLICATION.
GEORGE GLOVER & Co. LTD
RANELAGH WORKS. CHELSEA. LONDON. S.W.

RITCHIE C.I. PIPES FOR GAS & WATER. MIDDLESBROUGH.

J. & J. BRADDOCK

(Branch of Meters Limited),

GLOBE METER WORKS,

Telegrams: "Braddock, Oldham." Telephone 815.

OLDHAM,

AND

45 & 47, WESTMINSTER BRIDGE ROAD,

Telegrams: "Metrique, Lamb London." Telephone 2412 Hop.

LONDON, S.E.

MANUFACTURERS OF HIGH-CLASS

GAS STATION METERS.

BRADDOCK'S

STATION GOVERNORS

AND

RETORT-HOUSE GOVERNORS.

IMPROVED

WET & DRY GAS METERS

OF BEST QUALITY.

BRADDOCK'S PATENT

"SLOT" METERS.

FULL PARTICULARS ON APPLICATION.

That Exhauster Oil—

Which is extra refined and has no sediment,
Keeps the Blades sliding freely,
Clears away all heavy viscous tarry matter and maintains perfect running of the Exhauster for the longest period without attention, IS

Macpherson's Xtra Refined E.O.

Manufactured by

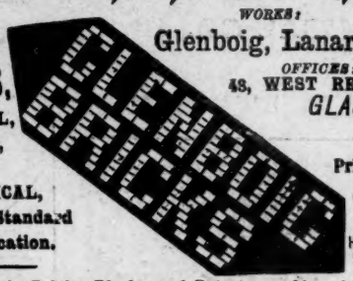
DONALD MACPHERSON & CO., LTD.,
Knott Mill, MANCHESTER.

THE GLENBOIG UNION FIRE-CLAY Co. Ltd.

WORKS: Glenboig, Lanarkshire.

OFFICES: 48, WEST REGENT ST., *GLASGOW.*

GAS-RETORTS, HORIZONTAL, INCLINED, and VERTICAL, to New Standard Specification.



—57—
Prize Medals & DIPLOMAS OF HONOUR, Grand Prix Brussels 1910, HIGHEST AWARD wherever exhibited.

The Glenboig Bricks, Blocks, and Retorts combine, in the highest degree, the qualities of not melting, and not splitting, when subjected to the highest heats and sudden changes of temperature, and are, in consequence, found to be economical, even in districts where the local bricks can be had at half the price.

DONKIN

for

GAS EXHAUSTING PLANTS.

VALVES, REGULATORS AND GOVERNORS, COMPRESSORS.

THE BRYAN DONKIN COMPANY, LTD.,

Head Offices & Works, CHESTERFIELD.

LONDON OFFICE: MILLBANK HOUSE, Wood Street, WESTMINSTER, S.W.

Chesterfield Telephone No. 84.
London Telephone No. 5358 Victoria.

Chesterfield Telegrams, "Donkin, Chesterfield."
London Telegrams, "Donkin, Vic. London."

JOURNAL OF GAS LIGHTING & WATER SUPPLY.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. CXXXVI., No. 2790.] TUESDAY, OCTOBER 31, 1916. [68TH YEAR.

EDITORIAL NOTES.

The National Gas Council and the Gas Companies' Protection Association.

THERE were two important matters raised at the meeting of the Gas Companies' Protection Association last Thursday bearing upon the occupancy by the Association of a still larger field of usefulness than it has tenanted in the past. It has been a conservative, unpretentious organization, with a powerful way of hitting-out when roused to action; and the result has been a record of valuable work for the industry in relation to matters that have had large influence upon the changes and progress made by the industry. But recently, especially during the war, the Association has found that it could usefully bring good influence to bear in seeking "protection" in fields other than the legal and parliamentary; and so it has joined forces with kindred organizations in the attempt to prevent those war conditions which press heavily upon the industry drifting from a bad to a worse state. Then came the proposal for the formation of a National Gas Council, which, through its composition alone, now holds most prominent status in the industry, and will in one body represent the concentrated power of separate organized forces—and something more, because it brings influence and authority to the general work of the industry that were estranged from it through there having previously been no organization to welcome and to accord them place. They have both welcome and place now; and in the gas industry there is well-founded hope that, without relieving any existing organization of its individual responsibilities, there will be good work resulting from what has been done.

Some people have been rather wondering why the Gas Companies' Protection Association has been brought into the National Council, and given equal part, power, and representation with the Institution of Gas Engineers and the British Commercial Gas Association, and greater than the Society of British Gas Industries, in that this body is denied constant participation in the work of the Executive Committee. But one has only to read the remarks, at the meeting of the Gas Companies' Protection Association, of the Chairman (Mr. Harry E. Jones) and of Mr. D. Milne Watson to obtain all satisfaction on the point of justification for the inclusion of the Association. The Association is an indispensable element in the work of the National Council, inasmuch as that work will comprise many parliamentary and legal matters. But supposing this self-contained and self-satisfied body had decided to continue an independent career, it would with time have meant eclipse for itself, and yet a weakening of the National Council by the deprivation of the strength the Association could supply from its organization, records, and experience. The National Council could not, dealing largely with policy, have neglected legal and parliamentary questions; and sothe Association would, by being overshadowed by the National Council, have lost position, prestige, recognition, and would—slowly perhaps, but surely—have receded into oblivion. While it did continue to exist, there would have been overlapping of work; and there has been more than enough muddle caused by overlapping action on the part of the industry's organizations, and so the loss of a considerable amount of efficiency. The National Council, if it successfully works to effect intention, means the increasing of the efficiency with which all the work of the industry is handled, and which efficiency has not been, and could not possibly be, obtained through separate organizations working each in its own way, with occasional collaboration, which has meant, through the very cumbersomeness of the disunited and complex machinery, loss of both power and time. The marvel is that all this has not been seen before by those who were in the position to order differently. Truly, there is not much for which to be grateful to the war; but that it has brought appreciation of the fact that, for its general work, the industry was badly organized is something for which the industry should have cause henceforth to be profoundly thankful.

The second matter of importance announced by Mr. Jones is that the Association is considering the question of making a radical alteration in its constitution. The Association has been one for the "protection" of gas companies. But gas companies do not comprise the gas industry; and probably nine-tenths of the work upon which it has been engaged has relation as much to municipally owned gas concerns as to company undertakings. It has been exclusive; and every municipal gas undertaking has been barred from entry as though it was an enemy at the door, instead of being in every way a rightful participator in the work of the organization. Occasionally—very occasionally—affairs which have occupied the attention of the Association have been of a kind which ran counter, here and there, to municipal government of electricity supply undertakings. There is, for instance, the question of undue preferential charges for electricity supply. But there again those in immediate charge of municipal gas enterprises are not by any means favourable to the continuance of a system which adversely affects the interests of the undertakings for the management of which they are responsible. The result of the exclusion from the Association has been that various legal and parliamentary matters affecting municipal gas undertakings have been dealt with through the Associations connected with municipal corporations and district councils; and, in this way, there has again been a bad overlapping of organized effort. There may still be occasions on which gas companies' interests that need protection will clash with municipal views, but not necessarily with the views of those in charge of municipal gas undertakings. On such questions as rate-aided competition, and unfair taxation as between gas and electricity undertakings, there will be found sympathy with the gas companies' point of view on the part of the responsible men at the head of municipal gas departments; and, though the constitution of the Gas Protection Association is extended so as to include municipal concerns, it will be found, judging from our knowledge of the municipal gas committeemen that we have met, that they will willingly remain passive in order that the gas companies may put their claims to test before the right tribunals to secure justice. However, this by the way. The Committee of the Association are considering the broadening of the constitution; and it is hoped in due season a recommendation and scheme will be put before the members. It is the natural concomitant of what is being done in connection with the representation of the whole industry on the National Council, on which the Association could not well be the legal and parliamentary element without it incorporated within its own self municipal as well as company gas undertakings. In relation to all general matters, the Association will, by such extended constitution and representation, have its hands and its operative power vastly strengthened.

Work of the British Commercial Gas Association.

OTHER than people engaged in munitions making, in the running of ships, and in trading in foodstuffs, coal, and oil, the only piece of enterprise of which we know that has not through the war suffered in some substantial way is the British Commercial Gas Association. Its vitality, the war notwithstanding, is unimpaired; its work is permeated with that acumen which detects the right subject with which to deal, the right time, and the correct channel or channels for the operation. And what is equally good is that the subscribers have found the paying of their subscriptions to the Association a much more pleasant proceeding than the discharging of liability for income-tax at the present high rates, or the paying of the excess prices exacted by some

avaricious coalowners. Not only so, but during the two years of war some seventy other gas undertakings (thirty of them during last year) have desired to take part in the enterprise, and to bear their fair share of the expenses; and as the report of the General Committee—which we reproduce elsewhere, and which is signed by the President, Sir Hallewell Rogers, and the Chairman of the Executive, Mr. F. W. Goodenough—shows, some of these new comers are highly important undertakings. They are cordially welcome; and their enrolment says more for the value of the work of the Association and the impression made by the work, than anything else (except perhaps the staunch adhesion of prior subscribers) could possibly do. There is now a total of 490 subscribing undertakings, representing well over 80 per cent. of the total output of gas in the United Kingdom. There are several hundred undertakings representing the balance of 20 per cent. of output; and it is hoped that all will come in. Another thing of which we are reminded by the contents of the report is that the influence of such work as the Association has done and is doing has no limits. It is not even confined by the sea-board of the British Isles. Just as the Overseas Dominions have contributed much to the prosecution of the world-disturbing war, solely in order to help to maintain the honour and dignity of the Mother Country, and to suppress a ruthless militarism that sought to set the forces of might in supremacy over right, so the gas undertakings of the Overseas Dominions are helping the Association in its work of establishing the gas industry's interests on higher and higher planes through educational, publicity, and other means. The influence of such work, we repeat, has no bounds; and it is certainly a crowning testimony to have subscriptions to the work coming from thousands upon thousands of miles away.

The work of the year has appropriately had a bearing on the movements of the times, in connection with the war, and with the industrial and economic developments of the country, current and prospective. Much could be written on the question of the wisdom of spending money to-day, in order to assure the morrow of the industry and its continued increase. We are looking to a substantial expansion of the industry's service; and a fundamental essential to this expansion is the disposal of more gas. The Association is working to this end in various ways. For example, the prospective customers of the industry are the children of the present; and the Association is doing all in its power to see that the children shall grow up with a true knowledge of the divers uses and advantages of gas. There are the architects, builders, doctors, sanitary officials, and others who help "to mould and guide public opinion." It is necessary for these influential ones to be constantly informed regarding the most efficient and improved gas appliances, in order that, in every sphere of its application, gas may occupy its rightful place, and may render its maximum efficiency. But this requires money.

The accounts for the past year are of good aspect. Notwithstanding that it was a war year, they came second in the record of total amount. The best year was also a war year—1914-15. There are, however, various reasons for the decline. In the first place, the Institution of Gas Engineers retained a somewhat larger amount than formerly for research and special purposes. The Institution, at the origin of the Association, invested themselves with the right to allocate, for research and special purposes, a sum equal to 10 per cent. of the subscriptions; and, so far as we remember, they have never exercised the power to the full. But now that the National Gas Council is in existence, it is to be hoped that some attempt will be made to finance research and special purposes without any trenching upon funds that are all required for the work upon which the Association is specially engaged. There is good profit in research, just as there is in publicity, in educational, and in information circulating work; and we should therefore like to see research financed independently. The second cause of the shortage between the past year's and the record year's income is a reduced contribution from the Society of British Gas Industries. The members of the Society have been talking a good deal about after-war trade; they must not forget that the Association is doing its part in preserving the gas trade during the war, and paving the way for that increase of consumption which will, upon the restoration of peace, return the "peak load" of business to the manufacturers and contractors. There is also an increase in the arrears of subscriptions due from gas undertakings. Happily this is not serious; and there are the new undertakings doing a share in creating the counterbalance. But towards the end of the Committee's report, there is a remark that serves as a comment on all three reasons for the diminution in income compared with the year preceding. It is this: "The Committee find themselves constantly restricted in "operations by the need of more money, and appeal to "all members to do their utmost to increase the income "of the Association in the current year, and so help "to consolidate the foundations upon which, when normal "times return, a largely increased prosperity may be es- "tablished." The subscribers are well guarded, through the Committees of the Association, in respect of the expenditure of their money; and therefore the non-subscribing undertakings and firms should see to it that the opportunities and efficiency of the Association are not curtailed by the absence of contributions from them. There is the machinery; its output should be carried to the highest possible level. There are several plans in embryo referring to the Association's after-war campaign and work; and while these are maturing, there is no neglect of the work lying at hand nor of the programme for the new financial year. Like farmers, the Executive Committee consider the question of the best fertilizers, the best seed, and the best times of sowing, in order that a golden harvest may in due season be reaped.

Profit-Sharing and Municipal Employees.

"WHERE there's the will, there's a way" is an aphorism that has application in many things, but not in all; and in the "many things" there is a good deal of limitation. There is, for example, co-partnership, which has been with success incorporated in the policy and working of several gas companies. It has its limits—it cannot be applied to municipal trading undertakings. Its less efficient substitute, profit-sharing, can be. But the introduction of this makes a distinction between those municipal employees in productive concerns and those in other branches of the urban service. But for a long time in municipal circles, there was a disinclination to consider whether even a profit-sharing system was capable of incorporation in communal trading concerns; and it must be admitted—we do not say as a result of this, but the fact is significant—that, taking as illustration the gas industry, there has been considerable labour trouble in municipal undertakings of recent years, while similar difficulty has been relatively infinitesimal in co-partnership gas undertakings. There were those who at one time sneered at the anticipated effect of a money interest in a business over and above the ordinary rates of wage, being the creation among employees of an individual interest in work. But succeeding years furnish proof of the truth of the effect. Wage earners are human; the majority of them are intelligent; and the supplementing of earnings by producing greater economies through good work is a process that appeals to them with excellent result.

We may repeat: "Where there's the will, there's a way." Though co-partnership cannot, in the sense that the men become stock or share holders, be applied to municipal trading undertakings, ways have been found of instituting profit-sharing; and gradually the application of the system is being extended. The Stafford Corporation some years ago associated it with their gas and electricity concerns. That was in the days there of Mr. J. Ferguson Bell; and the succeeding Engineers, Mr. Hubert Pooley and Mr. W. M. Valon, have both borne testimony to the efficiency of the system in producing contentment and diligence. So what could be more natural than—with Mr. Bell as their Consulting Engineer, and a sympathetic Gas Manager such as Mr. R. S. Ramsden in office—that the profit-sharing system should be incorporated in the working of the Burton-upon-Trent gas undertaking. It has been introduced; and Mr. Ramsden last Thursday described the system and its effects to the members of the Midland Association. Briefly, the basis of the system is, when the net cost of gas for manufacturing, distribution, and all other charges, exclusive of interest and payment of loans, is in any year less than 2s. per 1000 cubic feet of gas sold, then the employees of the Gas Department—from manager to office boy throughout, excepting only the clerks in the Borough Treasurer's office—are entitled to a bonus upon salaries, wages, sick pay, or accident pay received by them, calculated at the rate of ½ per cent. for every penny or fraction of a penny below the 2s. The basis of net costs is, no doubt, the best for a municipal gas undertaking profit-sharing

scheme. There are several instances now of municipal electrical undertakings that have a profit-sharing system in operation; but while we believe there are instances where the schemes are based on net generating costs, generally (it is understood) there is a preference for taking a percentage of the profits for bonus purposes. Both systems have their good points. Net costs, in the case of gas to the holder, however, only include the efforts of the manufacturing side, and not those of the distributing and sales of gas departments. On the other hand, if gross profits were taken, this would include much else than the efforts of the employees; for the profits are the outcome of several factors other than labour—more so than in the case of net costs. Therefore, on the whole, the net-cost-in-the-holder basis is perhaps the one that is most to be favoured.

Mr. Ramsden's short acquaintance of the system enables him to confirm prior experience, that the bonus which is augmented by good working does appeal to the best side of men, and increase diligence and efficiency. This is the experience too in municipal electrical undertakings. Moreover, once the men have received a bonus, they do not like it to diminish; but they soon understand that participation in profits also means participation in the reduction of profits caused by adverse circumstances. Owing to the adverse circumstances during the year 1914-15, the profit bonus at Burton was reduced to 2½ per cent. "This was a dis-"appointment to the men; but"—a significant observation of Mr. Ramsden—"I think it made some of them "more careful during the following year." The point of the contribution and of the discussion that is of greatest interest is the growing recognition in municipal management and policy of the usefulness of the bonus scheme, not only in promoting contentment but energy. Municipal service has hitherto proved—and largely—its own deficiency in the wherewithal that contributes to the maintenance of peace and goodwill as between employers and employees. Mr. Ramsden and others show the way to better conditions, though the conditions are not all we should like them to be.

Benzol Recovery at Wombwell.

THE members of the Manchester District Institution of Gas Engineers visited Wombwell last Saturday—mainly for the purpose of inspecting the benzol and toluol recovery plant at the gas-works, and the bye-product coking plant of the Mitchell Main Colliery Company, and to hear and discuss a paper by Mr. P. D. Walmsley, B.Sc., and H. A. Morfey on the subject of "Benzol Recovery and Rectifica-"tion." Wombwell has been talked of by many technical gas men since it became necessary to wash gas in order to meet the country's needs for benzol and toluol; for Wombwell can probably take precedence among the small works in applying a very simple plant (which, by the way, was made by the Wombwell Engineering Company, from the designs of Mr. Mitchell), whereby gas washing by creosote oil is efficiently carried out, and the oil is debenzolized in a direct-fired still, and put into a condition for recirculating and use. For small works, the direct-fired still is preferable; seeing that it is cheaper to instal, and, if necessary, it can be adapted for tar dehydration. The simplicity of the entire Wombwell plant is its greatest charm; for it allows quite small works to adopt the (compared with tar washing) higher efficiency of oil-washing. Of course, with this plant, as with any other types, strict supervision is needed in order to obtain the best results; but if heed is paid to a few quite simple rules, and easily effected tests be applied, there should be no trouble whatever for the manager of small works. In the paper submitted to the visitors on Saturday, there was a description not only of the plant at the Wombwell Gas-Works, but of the plant and steam-heated still in operation at the Mitchell Main Colliery, which plant is equally suitable for large gas-works. With few exceptions, gas undertakings are new to the work of benzol recovery from gas; and, coming into it at this time of day, they find that it has been reduced to almost common practice, and that any variations there are mostly refer to structural or operative details—from washing, through the oil distillation, to rectification of the crude benzol. Those intimately acquainted with the subject found this in what they saw, as well as in the paper they heard read, on Saturday. The visit was a profitable one to many of the members; and it should be the means of encouraging the washing of gas by oil in all the smaller works in the district covered by the Manchester Institution. Wombwell silently says that no rational excuse now exists for small gas-works not contributing to the much-desired increase of the benzol output of the country.

Gas Purification and Oxide Moisture Content.

THE subject of the purification of gas can always be depended upon to raise a good discussion at a meeting of gas engineers. It did so at the meeting of the Midland Association last Thursday, when Mr. W. C. Jones, of Brierley Hill, presented some notes as to his experiences. The author appears to have gone about his work in an empirical manner, and has achieved results that are good, judged by general contemporary working. It was the former fact that supplied scope for much of the discussion; it was the latter fact that disarmed criticism, and toned-down the remarks of speakers to expressions of opinion, also based upon experience. Mr. Jones has in use the backward rotation system; and he has spacious purifiers—something like 40 per cent. more than is usually adjudged sufficient, taking the maximum daily production of gas. He suggests that the superficial area of each box should equal in square feet the maximum daily make in thousands. The four boxes that he has at Brierley Hill are each 20 ft. by 20 ft. by 6 ft. deep, and the daily maximum make of gas has not yet reached 400,000 cubic feet; so that Mr. Jones has very completely put into practice in this respect what he advocates. It is probably to this spacious purifying area more than to anything else that, under the conditions of his working, the efficiency of his purifiers is due, together with probably an efficient system of preliminary purification. Using North Staffordshire and South Yorkshire coal, the sulphur compounds in the purified gas vary between 19 and 30 grains per 100 cubic feet; the boxes have remained without emptying for 22 to 34 months; and the usual sulphur contents of the material is 40 to 50 per cent., and, in one instance that he quotes, 61 per cent. was reached.

As to certain points in his practice, it is necessary to read Mr. Jones's paper in conjunction with his reply to the discussion; for in the latter explanation is obtained as to what is meant by various statements in the paper regarding moisture content of the oxide and the admission of air. For instance, concerning the observation in the paper that the quantity of air that may be admitted is anything up to 5 per cent., "depending on the size of the purifiers," this is not to be taken that 5 per cent. is the quantity he admits, but that the quantity admitted is variable. The best working is that which limits the supply of air to the theoretical amount required in relation to the percentage of sulphuretted hydrogen. But even then one cannot ignore the increasing depreciating effect upon the illuminating power and calorific value of the gas as the quantity of air rises. Of course, one has to be prepared to suffer some loss for the sake of expediency in the matter of purifier efficiency and active life of material. But 5 per cent. of air is an amount that should be eschewed and not applied, unless there is some exceptional cause to warrant it. In regard to moisture content, the members must have heard Mr. Jones with some surprise; and he was somewhat emphatic on the point. One certainly does not want to pay for water and not oxide; and one does not want to put into the space of the purifiers any more moisture than is requisite, as the space occupied can be better devoted to a more useful purpose. On this subject of moisture content, authorities differ. The permissible percentage depends upon the physical condition of the material. But, generally speaking, all that is required is that the oxide should be held together in a light granular state, with also consideration to other points which will be referred to presently. But Mr. Jones says that, if two oxides were "submitted" to him—one containing (say) 40 to 45 per cent. of moisture and the other 55 to 60 per cent., and where the physical condition "appeared" to be the same, he should, without any hesitation, choose the latter. Again: "The best bog ore I ever used was one containing "59·5 per cent. of moisture." Still further: "I assert that "very often the oxide containing the largest percentage of "iron and the lowest percentage of moisture is the one that "should be avoided." That he does put into his purifiers a considerable amount of moisture is shown by the statement that one sample of bog ore when placed in a box contained nearly 60 per cent. of moisture; and, when removed and sold, it contained 6·8 per cent. of moisture, and 61 per cent. of sulphur. It would be interesting to know whether the 6·8 per cent. was the average, or was found in

the oxide taken from some particular part of the purifier, as Mr. William Bennett, in a recent paper before the Scottish Junior Association, showed that, with downward flow of gas, the moisture of the material removed from the purifiers (with hurdle grids) at Greenock varied considerably as between the top portion, the centre, and the bottom. But anyway the difference between 60 per cent. and 6·8 per cent. is considerable.

In his recent annual report, Mr. W. S. Curphey, the Chief Inspector under the Alkali Works Regulation Act, showed that the moisture condition of oxide is one that requires to be treated on a scientific basis, and not merely empirically. He pointed to the fact that the hydration condition of oxide may considerably affect the reactive capacity of the oxide, and that a degree of moisture that may be suitable when the material is relatively rich in ferric oxide may be unsuitable when it is more or less spent, and relatively poor in ferric oxide. In the adjustment of moisture-content, regard should therefore be paid to the progressive diminution in the proportion of reactive hydrate present as free sulphur and other impurities accumulate in the mass. The warning was given by Mr. Curphey that any moisture in excess of that required to maintain the reactive oxide in a due state of hydration is likely to lower the purifying efficiency of the material; and, further, that, when adjusting the moisture content of an oxide, consideration should be paid to the working temperature of the system. We are afraid that there are very few works at which scientific control to this extent is given to purifier conditions; but, as recently seen, there has been a close study of purifier conditions at Greenock, and there the grains of sulphur in the distributed gas are maintained at a very low point. In Mr. Jones's case, the results—we do not overlook coal, temperature, and other conditions that affect the sulphur content of gas—fall far short of those at Greenock, although they are not at all bad in comparison with results generally. Such as they are, we are inclined to think that they are due more to large purifier capacity than to the heavily moistened condition of the oxide.

The Shortage of Coal Output.

For the second time, there has been a national conference of coal owners and miners under political auspices; and addresses were delivered by both the Prime Minister and the Home Secretary, with a view to urging a greater production of coal, in order to meet what is stated to be a deficiency between supply and demand. Words have not hitherto succeeded in creating a new spirit among the miners as a whole, nor for the matter of that among the owners as a whole; but whether they will be more successful on this occasion cannot be said. There was a partial response from both quarters as the result of the previous conference; and there has been some effect since from the work of the Committees who are, by the method of gentle persuasion, trying to get the miners to work full time, and not take so much leisure while the country needs their service. But the fact remains that the effect has not been general; and the reflux of the tide of absenteeism has already set in too vigorously to be pleasant. The Prime Minister, in his speech, paraded all the old figures as to recruiting from the mines and the decrease of output—taking the exceptional year 1913, when 287 million tons were raised, as the basis, and 253 millions of 1915, to show that the output had fallen 34 million tons. At the same time, he glided gracefully over the fact that the also exceptional export of 73½ million tons in 1913, was reduced by 33½ million tons in 1915; so that a balance between output and the quantity of coal available for home consumption was about struck.

The Requirement and the Men.

If therefore there is any shortage, then it must be through a largely increased home demand, due to the requirements of the nation for the Navy and for munition work. But, on the other hand, the works that are busily engaged on munitions of war have been largely taken off their normal coal-consuming work, and much less coal must now be required for the mercantile shipping. We have been curious as to what is the quantitative nature of the increased demand. The Home Secretary now tells us it is 15 million tons. But no one explains how this amount is arrived at. If, however, there is any real validity in the figure, then it is gratifying to know that, if half of the 10 per cent. of absenteeism to-day is annihilated by the patriotism of the men, the shortage will be compensated. But the miners on their part assert, through Mr. Robert Smillie, the President of the Miners' Federation, that there are coal owners who are to blame for some of the deficiency of output, through not providing facilities for enabling the men to increase the output at certain pits. There seems to be no question that this charge has some foundation; and it is up to the coal owners concerned to set to work at once to make good. The conference passed a resolution which registered the belief that a considerable increase in output could be obtained if every facility was afforded for regularity of work, and if avoidable absenteeism is prevented, and pledged those present to do everything in their power, by co-operation between employers and workmen, to secure this result. The President of the Mining Association (Mr. Adam Nimmo), himself a coal owner, asked, "How are we to create an atmosphere and develop a new spirit of life and vitalize the forces in the colliery districts?" If the present gigantic struggle, if the heroic facing of death on the battle fronts, if the nation's necessities in the great emergency cannot effect what is needed, then those coal owners and those miners who are through inaction blocking the path to the greater development of output merit the contempt of all honest men.

A Limit to Shop Lighting Hours.

To the many orders designed for the protection of the community, and for producing further economy in the national interests, the Home Secretary has, under the Defence of the Realm Act, added another. This will from yesterday until April 30 next compel all shopkeepers to close their premises—excepting so far as there is specific exemption, or other regulations apply—at or before 8 o'clock on all evenings except Saturday, when the time will be nine o'clock. This will ensure uniformity in closing, and will relieve the police officers of late inspection work to see that the regulations as to light obscuration are not infringed. The shops that keep open the latest are usually the ones that are most troublesome. While traders are all treated alike, there can be no valid objection to the new order; for late shoppers will now simply have to change their habits. A little discipline will do these people no harm. As to the economy that will be effected, this will be more in favour of the health of shop assistants than in any other direction. The order will not affect wealthy West-end retailing establishments, the closing hours of which have usually been well within those now defined; so that there will not be much difference in the consumption of illuminating agents compared with the curtailed consumption that was already ruling through the edict on outside shop lamps. The same applies to the suburbs and to the provinces, as even six or seven is not at all an uncommon time for the best-class shops to close, save on Friday and Saturday. The loss of gas consumption, compared with last winter, will be greatest on Saturdays—especially in districts patronized by the poorer classes—and perhaps, too, there will be some shrinkage on Fridays. But familiarity is causing the vendors of illuminating agents to look philosophically upon the additional curtailments of the means of securing output in the lighting business—more especially as they are second to none in acknowledging that national interests must take precedence of private ones.

Contrary Decisions.

There is more stringent supervision this winter than ever before to see that shopkeepers, householders, and others comply with the lighting regulations. Supervision ought not to be required, and would not be were it not for the indolent, the careless, and those who appear to have an inclination for rendering aid to the enemy rather than to this country. However, punishment more commensurate with the infraction of the regulations is being inflicted—in some cases, no opportunity is being given to pay a fine, but imprisonment is the penalty. Where there are money penalties, they are now of a heavy order. Some recent specimens for the escape of light from private premises are such as £20 and and £25. We have no sympathy with people who do not obey these regulations; they ought to be made to suffer. But in every case the penalty should be imposed upon the real delinquent, and not upon a substitute. That is the only way to make people heedful of these matters. But on this point decisions have been given that appear to be directly antagonistic. In one case affecting hotel visitors occupying rooms in which notices of the lighting order have been placed, a manageress contended at the Maryle-

bone Police Court that, if all hotel visitors considered themselves exempt from responsibility, it would be a direct encouragement to carelessness on their part. We agree with this submission, and so does Mr. Paul Taylor, the Magistrate. He decided that visitors should certainly be held responsible; and in the result a visitor in whose room the light was showing in the hotel in question, took the place of the original defendant, and was fined 40s. On the other hand, at the Marlborough Police Court, there was a case in which a person was in charge of premises during the absence of her master, and another servant left the light burning in her room. In this instance, Mr. Denman refused to allow the passing on of responsibility. There fell from his lips a remark which appears to be a contradiction of the refusal. He said there was a duty cast upon every person in every house—whether master or servant—to help to safeguard their fellow creatures. In a further case, this was in the City—the manager of a company was fined £25 for having an exposed light, although he had given orders as to the screening of all lights, and albeit the magistrate was satisfied that he knew nothing about the unscreened light. Somebody has to pay; but if the actual offender was brought to book, and was made personally liable, it seems to us that the lesson of individual responsibility would be driven home with greater effect.

A New Secretary of the Gas Light and Coke Company.

The Directors of the Gas Light and Coke Company have appointed Mr. W. Beckford Long to be Secretary to the Company in succession to Mr. Henry Rayner, who has retired. Mr. Long entered upon his new duties on the 27th inst.

CALORIFIC STANDARD ACT APPLICATIONS.

Eighth Official List.

Intimation is made by the Board of Trade of the receipt of applications from the following Gas Companies for Orders under the Gas (Standard of Calorific Power) Act, 1916; the standard proposed in both cases being 500 B.Th.U.:

Bothwell and Uddingston Gas Company, Limited.

Leamington Priors Gas Company.

PERSONAL.

Mr. P. O. Brien, of Magherafelt, has been appointed Manager of the Gas-Works at Ballybay (co. Monaghan).

Mr. Frank Bateman, who has been in the service of the Heckmondwike Gas Company, has been appointed Assistant Gas Manager at Stalybridge.

Mr. James Diggle, the Engineer to the Heywood and Middleton Joint Water Board, has completed fifty years' service in connection with the Heywood water undertaking. At the meeting of the Board last week, an illuminated address was presented to him.

Mr. J. E. Lister Cooper, the Secretary and Manager of the Yeadon and Guiseley Gas Company, has been the recipient, on the occasion of his recent marriage, of a handsome oak writing bureau and bookcase from the Directors of the Company, and an oak inlaid clock and copper and brass ornaments from the workmen and staff.

Arising out of the promotion of Mr. R. H. Brown to the position of Chief Gas Engineer and Manager to the Birkenhead Corporation, a considerable re-arrangement has been made of the staff at the gas-works. Mr. Harold E. Stone, the Assistant Works Superintendent, has been appointed Deputy Gas Engineeer, at a salary of £300 per annum, rising to a maximum of £380. Other advances in salaries have also been granted.

It was stated at the meeting of the Ceará Gas Company on Friday that the agreement with Mr. John Reid, the Engineer and Manager, expired last June; and Mr. Reid did not wish to renew it. In these circumstances, the Directors have appointed to the position Mr. W. A. V. Watson, who has been in the Company's service for some time. Remarks appreciative of Mr. Reid's work on behalf of the Company were made on both sides of the table at the meeting.

OBITUARY.

We are sorry to learn of the death of Mr. F. F. Farrand, the Engineer and Manager of the Ryde Gas Company, who was born in 1847, at Halstead, at the gas-works of which his father was at onet ime manager. Deceased was assistant to his father during the erection of the gas-works at Waddon, Croydon, and remained with the Company until the opening of the works. Then he spent some time in the service of Messrs. Joseph Quick and Son, and was engaged in the erection of the Caterham and Kenley Gas-Works, of which he for some years held the position of Resident Engineer. Subsequently, he was with Messrs. S. Cutler and Sons, and was engaged in the erection of new works at Tunbridge Wells, from the designs of Mr. R. P. Spice. Then he was appointed assisfant to the late Mr. George Garnett at Ryde, and on that gentleman's death in 1895 succeeded him as Engineer and Manager. He was a member of the Southern District Association of Gas Engineers and Managers, and was well known in Masonic circles.

JOHN GIBSON NEWBIGGING.

With tragic suddenness, Mr. John G. Newbigging, M.Inst.C.E. passed away, through heart failure, on Saturday night. The whole gas profession will mourn his premature loss; for in its ranks—not only because he bore an honoured name, but because of his own personal qualities and talents—he was a stalwart among the younger generation of gas engineers. He was an engineer to the backbone, a good manager, a good organizer, and a good friend. Although on one or two questions of policy, there was disagreement with him, he was an opponent after our own heart. He could hit hard in controversy, but he did not bear animosity; and one met him again, after a struggle, in excellent friendship. He was a man of pronounced views and thoughts, but, in the main, everything upon which he expressed opinions was governed by personal research, experience, and deduction. In the gas profession, his record had led us all to look for much from him as one of the leaders in the industry's coming developments, for he occupied no rut—the intellectual gifts with which he was richly endowed prevented him doing that; and he was one of those who was with confidence looking for a large extension of its horizon and sphere of activity. To that end he was to almost his last hour working industriously. In mourning his loss, we do not forget others. In the name of the whole gas fraternity, deepest sympathy is tendered to Mrs. Newbigging and the family. For them the blow is a terrible one. To the Chairman (Alderman William Kay) and the members of the Manchester Corporation Gas Committee, to the Superintendent of the Gas Department (Mr. Fredk. A. Price), and all his colleagues, sympathy will go forth; for Mr. Newbigging was among them all—from Chairman downwards—well-beloved not only for his work, but for his other personal merits. He has worked well for advancing the interests of the Corporation Gas Department; he has been a fearless champion of its rights against a municipal policy—the appropriation of profits in relief of the rates—which transgressed his notions of justice. As the Corporation Gas Engineer, he carried on with expanding credit to himself the great reputation established and continued by his predecessors in office. We all sorrow that a life, over and about which hovered such great expectations, has been cut so short.

From Mr. Price, we have received the following particulars of the end of our friend; the date of the letter being Sunday: "You will be grieved to hear that I received a message at midnight that our Engineer, Mr. J. G. Newbigging, had passed away; the cause of death being heart failure. He had a seizure of some kind a week ago at the works; and when he came to my office for lunch, he complained of feeling queer. I got him some brandy, but he would not partake of it; and I persuaded him to go straight home in his car. I 'phoned at eight to ask how he was; and the reply was that the doctor had ordered him to bed for a prolonged rest. We have heard from day to day of his progress, and were not alarmed until Friday night, when I heard the eminent heart specialist, Dr. Steele, had been called in. His daughter telephoned, and said he had a bad night; but the doctor reported that he was no worse. However, the end came as I have stated."

Mr. Newbigging was a son of the late Mr. Thomas Newbigging, of Manchester, in whose office he served his articles—afterwards spending two years with Messrs. J. & J. Braddock, of Oldham, working at the bench in the manufacture of gas plant of all kinds. After acting as Assistant at the Regent Road and Liverpool Street works of the Salford Corporation (which was his first appointment), he was given entire charge of the Bloom Street station. Then for upwards of two years he was Engineer and Manager of the Pará Gas Company, a post which he was compelled to give up owing to the trying climate. It was in 1888 that he went to Pará; and three years later he was in the United States, adding to his knowledge with regard to the manufacture of carburetted water gas. During the year 1892, considerable extensions were carried out at the Macclesfield Corporation Gas-Works, under his supervision; and after being temporary Manager there for some time, he was, in December of that year definitely appointed Engineer and Manager. He remained at Macclesfield seven years, during which period the capacity of the works was doubled, and the price of gas substantially reduced.

Consequent upon the tragic death of Mr. G. E. Stevenson in 1899, the position of Engineer to the Manchester Corporation Gas Department became vacant; and in January, 1900, we were able to announce in the "Journal" that Mr. Newbigging had been selected to fill it. He has thus been at Manchester close on seventeen years; and he has died—at the comparatively early age of about 54 years—leaving behind him a record of work of which he had every reason to be proud. Glancing at Mr. Price's annual com-

pilation of statistics, it is seen that in 1900 the output of gas was 4726 million cubic feet, and that for the year ended March last it had been increased to 6067 millions. In the earlier years, the assets of the undertaking figured at £2,382,396 (or 89·75 per cent. in excess of the liabilities); and on March 31 last, at £3,493,050 (or 183·76 per cent. in excess of the liabilities). In the same time the total income of the department has risen from £654,527 to £935,843. These figures are of themselves conclusive evidence of a strenuous time for the Chief Engineer; and as a matter of fact, going back some years, it may be recalled that in October, 1904, there appeared in the "JOURNAL" a full account of the various manufacturing stations of the Manchester Corporation, together with nearly a dozen photographs showing some of the work that had up to that date been carried out since the appointment of Mr. Newbigging, and under his direction. Not very long afterwards, there was begun the erection of a holder (designed by him) at the Bradford Road station, of such a capacity—nearly 10½ million cubic feet—that in this country it was exceeded only by the well-known one at East Greenwich. As recently as May, 1914, a full account of the carbonizing plant at the Rochdale Road works was given by him in a paper which he presented to the Manchester District Institution of Gas Engineers.

Mr. Newbigging had much experience in parliamentary, assessment, arbitration, and consulting work; and in this connection, readers will remember that, in conjunction with Mr. Isaac Carr, he appeared in the Committee-Rooms in opposition to the reduction of the illuminating power of gas which would be occasioned by the use of the "Metropolitan" (No. 2) standard burner. At the same time it was well known that the Manchester Corporation themselves had adopted this particular burner as their standard. The point, however, of the attitude taken up by Mr. Newbigging was that, on the adoption of this burner by gas undertakings working under the sliding-scale, there should be some concession made in the matter of price which would ensure the consumers getting compensation for the improved results accorded to the gas by the new burner. But as a general rule the Parliamentary Committees recognized that the sliding-scale itself ensured that any economies secured as the result of the use of the new burner would automatically yield benefit to the consumer. Without making specific allusion to Mr. Newbigging's consulting work, we may cite, as an instance of the desire to secure his services, the fact that in 1909 the Calcutta Corporation invited him to proceed to India to advise them on a new scheme which was under consideration for the lighting of the streets of the city; but in view of the important work then in hand at Manchester, it was felt to be impossible for him to be absent from duty for so long a time as the visit would have required.

In other directions, too, his help was keenly appreciated; and our volumes bear ample testimony to his activity as a reader of papers before Technical Societies, and to his willingness on all occasions to permit others to enjoy to the full the benefits of his experience.

Mr. Newbigging was transferred to the list of members of the Institution of Civil Engineers in 1903. He was President of the Manchester District Institution of Gas Engineers for the years 1914 and 1915; and he also occupfed the position of President of the Manchester Association of Students of the Institution of Civil Engineers.

The last service will be performed at the Manchester Crematorium to-morrow (Wednesday) at one o'clock.

A POLARIZATION FLICKER PHOTOMETER.

Among the notes contributed to the current volume of the "Journal of the Franklin Institute" by the Chief Physicist of the United Gas Improvement Company is one on the above-named subject written by Mr. Herbert E. Ives.

The author says: One of the most essential features of the flicker photometer is the entire absence of mechanical flicker, as caused by the dividing edge between the two fields which are alternated. For this reason some means of eliminating the edge has long been desired. From another standpoint—that of the theoretical treatment of flickering light—it is highly desirable to have an instrument in which the transition from one light to the other occurs according to some simple mathematical relation. The simplest relation is the sine curve, on which basis the theory of the flicker photometer has been handled by the writer and Mr. Kingsbury. The polarization flicker photometer recently constructed meets both these demands completely. It consists of a double image prism (Rochon or Wollaston prism), combined with a rotating Nicol prism. The double-image prism forms two images of each half of the photometer field—one image being polarized in the horizontal, the other in the vertical plane. The horizontally polarized image of one field is superposed on the vertically polarized image of the other. On observing through the rotating Nicol prism, these two fields dissolve one into the other, following exactly the sine curve relation employed in the theoretical work quoted. Measurements have been made with this new photometer on the critical speeds for the disappearance of flicker for various ratios of brightness of the two fields. The results are in complete agreement with the previously developed theory, an accurate confirmation of which had not been found possible with the ordinary type of flicker photometer.

THE ANNUAL REPORT OF THE GENERAL COMMITTEE OF THE "B. C. G. A."

The General Committee present to the members, associate and international members, and to the administrators of the gas undertakings and firms subscribing to the Association their fifth annual report and statement of accounts.

This is the third report presented under war conditions; and it is a matter for congratulation that the Committee are able to state that an organization which had had less than two-and-a-half years of active life at the outbreak of war, and which depends for its continuance on the voluntary subscriptions of some hundreds of gas committees and boards of directors, and of the members of the Society of British Gas Industries, finds itself, at the end of over two years of the trials and difficulties created by a state of war, not merely with its vitality unimpaired, but with an increased and increasing list of subscribing undertakings.

NEW SUBSCRIBERS.

In the past year no less than thirty undertakings have been added to the list of subscribers—including such important undertakings as those supplying Bristol, Paisley, and West Bromwich—making a total of 490 who have joined since the Association was formed, and representing well over 80 per cent. of the total output of gas in the United Kingdom. The individual membership now numbers 960.

It is particularly gratifying to note that the new subscribers include two from the overseas Dominions—namely, Christchurch (New Zealand) and the South Australian Gas Company—bringing the number of overseas supporters up to nineteen. This is good testimony to the widespread influence of the Association's publicity campaign, and displays a readiness on the part of those far away to co-operate in finding the ammunition for the campaign which may be commended to the consideration of some undertakings much nearer home, who still have doubts as to the value to all undertakings of the work done at the expense of some.

The income for the year (after deducting receipts from the Society of British Gas Industries in respect of the preceding year) though higher than in any previous year, is rather lower than in 1914-15, for three reasons:

1. The retention by the Institution of Gas Engineers of a somewhat larger amount than formerly for research and special purposes.

This is not an occasion for concern, as the money is being expended by the Institution upon work—such, for example, as the inquiry into the life of meters—which is of value to the whole industry.

2. Reduced contributions by the Society of British Gas Industries.

This is a matter for very real regret, and will, it is hoped, be of a very temporary nature. While it is true that the exigencies of war time are necessitating the curtailment of capital expenditure by many undertakings, the necessity for that expenditure is accumulating, and will be increased by every penny spent by the Association now and in the future in stimulating the demand for gas. The claim of the Association for support upon every member of every section of the Society of British Gas Industries is, therefore, as great as ever; and it is hoped that the subscriptions received from the Society will in future far exceed a bare 10 per cent. of the total income of the Association.

3. A slight increase in the arrears of subscriptions due from gas undertakings. No account is taken of subscriptions until actually received.

This increase in the subscriptions in arrear at the close of the books is not serious, and will, it is hoped, be rectified in the course of the current year. The Committee appeal to all subscribers to keep their payments as closely up to date as possible.

CONFERENCES.

It is a matter for great regret that no district conferences could be held during the past year, and that once again the annual conference has had to be abandoned. But it is felt by the Committee that until the war is over, or at any rate until the end is definitely in sight, it is impossible for many managers, with their staffs seriously depleted, and with their works in so many cases in the danger zone, to travel to and remain long enough for conferences at centres far distant from home.

When peace is at hand there will be many subjects and plans of campaign calling for thorough discussion; and immediately the opportune season arrives the Committee will take steps to call a National conference as well as district conferences.

A NATIONAL GAS COUNCIL.

It is a matter for congratulation that steps have been taken for the establishment of a National Gas Council to deal as they arise with matters of importance and urgency that concern all sections of the industry, and call for united action on its behalf. The President, Vice-Presidents, and General Committee of the Association will *ex officio* be members of the Council.

PRESIDENCY.

In order the better to assist in the settlement of the details connected with the establishment of the Council, Sir Hallewell Rogers

has accepted the unanimous and cordial invitation of the General Committee to be nominated for re-election as President of the Association for the ensuing year.

Deaths.

The Committee have to record with deep regret the death on the 17th of May last of their Past-President, Sir Corbet Woodall, who was from its inception one of the warmest supporters of the Association, and contributed greatly to the success of its first annual conference at Manchester, over which he presided. The Association, in common with the entire gas industry of the world, has lost a great man; many of its members have lost a great friend.

The Committee have further to record with regret the deaths of three Vice-Presidents: Dr. Jeffery, the veteran Chairman of the Eastbourne Gas Company; Alderman Armitage, the Chairman of the Doncaster Corporation Gas Committee, who was a familiar and welcome visitor at the meetings and conferences of the Association, and brought the first municipal undertaking into membership; and Colonel Gascoyne, the Chairman of the Derby Gas Company, and a greatly respected figure in the life of that town and county.

The sympathy of all members will go out to the many among them who have lost those near and dear to them, as well as to the relatives of the many employees of the industry who have also given their lives as part of the terrible price which is being paid by the manhood of the Empire for the maintenance of freedom and civilization in the world. That those dear lives will not have been given in vain will be the consolation and pride of those they have left behind. That such shall be the case is the fixed determination of every one of us.

New Vice-Presidents.

The following have been elected Vice-Presidents during the year: Councillor William Clark (Doncaster), Mr. John Miles (London), Alderman J. W. Newbold (Derby), Alderman J. Nuttall (Blackburn), and Mr. D. Milne Watson (London).

Honours for Vice-Presidents.

Congratulations on behalf of the Association were sent last New Year's Day to two of its Vice-Presidents, the Right Honourable Sir Daniel Ford Goddard, M.P., and the Lord Provost of Edinburgh, the Right Honourable Sir Robert Kirk Inches, on the honours conferred upon them by His Majesty the King.

The Work of the Year.

The accounts show that, after meeting the cost of administration (which did not exceed 5 per cent. of the total expenditure) and paying £825 off the National Gas Exhibition deficit, leaving £500 to be paid in the current year, £16,084 was spent in publicity work during the year, as compared with £15,187 in the preceding eleven months.

The expenditure has been largely directed to making known the many industrial uses for gas, especially in munition works; to pointing out the advantages of gas for the lighting of factories and workshops (which has been the subject of inquiry and recommendations by a Home Office Committee); to advertising the possibilities of using gas for baking home-made bread, and otherwise assisting in the campaign for national thrift; to continuing the work of interesting teachers in the subject of gas, and providing them with material for lessons on its manufacture, distribution, and uses; and to bringing up-to-date information respecting gas prominently to the notice of architects, builders, doctors, sanitary officials, and others who help to mould and guide public opinion.

This work has been done not only by direct advertisements, which frequently receive the favourable notice of advertising experts, but by the distribution of literature and the provision of reliable and interesting material for the use of editors and writers in the Technical Press.

Much work and care have been devoted to the preparation of the various issues of "A Thousand and One Uses for Gas," and the interest and inquiries evoked by that publication have been gratifying. The circulation of this monthly exposition of the possibilities of gas in all branches of human activity—industrial, commercial, municipal, or domestic—is steadily increasing as managers more and more realize the value of the seed which is sown by its regular distribution in their districts.

The sale of advertising literature generally has shown a marked recovery over the preceding year, when for a time following the outbreak of war sales fell considerably. A careful revision of the Association's pamphlet, circular, and other literature is in process, pending the time when enlarged campaigns can be launched for the development of business after the war. Other plans are being prepared in anticipation of that time—notably in connection with the possible extensions of the use of gas for industrial purposes. A Special Committee has been established to deal with this side of the industry's development.

Assistance Rendered to Subscribers.

The records of assistance rendered to subscribers and their undertakings continue to grow, and to show that the Association is filling the need of a centre for information, advice, and help on all matters relating to the commercial side of gas supply in an increasing measure and to the satisfaction of the members. The thanks of the Committee are due to all those who so readily render assistance to the staff in providing inquirers with full and accurate information.

International and Associate Members.

The Committee are glad to report that nine additional international members and five additional associate members have been enrolled during the past year.

Coke.

Steps are being taken with a view to organizing, through the commercial sections, the establishment of depôts up and down the country for the supply of suitable coke for motor waggons. This has already been done with considerable success in the South of England by the London Coke Committee.

Policy for the Ensuing Year.

The Committee recommend that the work of the Association should be carried on with unabated vigour in the financial year that has now commenced, confining operations during the winter mainly to the specialized educational campaigns, and concentrating the general publicity on the early months of 1917, so as to develop as far as possible the spring and summer output.

The Committee find themselves constantly restricted in operations by the need of more money, and appeal to all members to do their utmost to increase the income of the Association in the current year, and so help to consolidate the foundations upon which, when normal times return, a largely increased prosperity may be established.

Annual Meeting.

The annual general meeting will be held at the Royal Society of Arts, John Street, Adelphi, at 2.30 p.m., on Wednesday, the 1st of November, to consider and, if approved, adopt this report and the statement of accounts to the 31st of August last; to elect a President for the ensuing year; to elect Auditors for the ensuing year; and to consider the following motion:

> That, in view of the continuance of the war, the retirement from office of those members of the Executive and General Committees who would otherwise have retired at this meeting be postponed until the annual general meeting in 1917.

Hallewell Rogers, *President.*

F. W. Goodenough, *Executive Chairman.*

Oct. 3, 1916.

ELECTRICITY SUPPLY MEMORANDA.

Greater London Considering Linking-up.

Linking-up is the subject of the hour. The bulk of the "Memoranda" was last week compiled of information as to schemes and rumours of schemes. Since then particulars have been published as to the constitution of the Joint Committee of Engineers appointed by the Engineers' Committee of the Conference of Local Authorities in Greater London owning Electricity Undertakings. This title had better be read and re-read in order to grasp it. It is a lengthy one; and the Committee are (if we remember rightly as to the time their appointment was first talked about) keeping the title in countenance by spinning-out the time occupied by their work. It can only be about the same period that the London Committee's appointment was first referred to that the Lancashire-Cheshire Committee (whose report was noticed last week) began their investigation. Their schemes, however, are already the talk of the electrical industry; and action is proceeding to see whether the local authorities and companies concerned are, with the concurrence of the Government authorities, willing to proceed with the plans for the harvesting of the golden benefits that it is predicted would accrue. It seems to have taken the London engineers just as long to mobilize themselves into a Committee as the energetic Lancashire-Cheshire Committee have been in preparing their schemes. If the former do not hasten-up, and get out concrete plans for the whole of Greater London, there will be further linking-up of neighbours which may spoil the complexion of projects of a more ambitious order. Two or three interconnection schemes have already been carried out in the Metropolitan area; and the Hackney Borough Council undertaking and the North Metropolitan Electric Power Company have a plan in hand of a reciprocal supply character, which it is estimated will cost £6500. There is also in existence a National Power Supply Committee—the Committee appointed by the Incorporated Municipal Electrical Association and the Incorporated Association of Power Companies. The National Committee have honoured the Joint Committee of London Electrical Engineers by telling them that, in view of the existence of the latter, they do not themselves propose to convene a Committee for Greater London; but they hope the Joint Committee of Engineers will act in conjunction with themselves. It rather looks as though the Joint Committee of London Engineers are not disposed to have the National Committee interfering with their work; for they decided to send "formal" notice to the "national" body that, as representatives of private and public electrical interests, they are considering the "best" method of linking-up the generating stations of Greater London. "You mind your business; and we will mind ours" seems to be the message contained in the word "formal." On the Joint Committee are represented the Charing Cross, City of London, County of London, Kensington and Knightsbridge,

London Electric Supply, Metropolitan Electric Supply, and Westminster Companies; the Hammersmith, Battersea, Finchley, Croydon, Hackney, and Stepney Borough Councils; the London County Council, the North Metropolitan Electric Power Supply Company, the Great Eastern Railway Company, while the Joint Honorary Secretaries (Messrs. F. J. Walker and F. Tait) are supplied by the St. James and Pall Mall Company and the Poplar Borough Council undertaking. It is a strong Committee; and something gigantic and practical should issue from it.

Linking-up Gas and Electricity Concerns.

The "Electrician" takes quite a sensible view of the question of the linking-up of (at any rate) moderate sized gas and electricity concerns, from which we may conclude that the responsible writer of the technical part of our contemporary has no intention of joining the little company of feeble-minded ones in the electrical world who fancy that the gas industry (which is continuing to increase in stature and in participation in the world's work) is shortly going to depart this life through the attentive operations of the electrical industry. The "Electrician" has found interest in the paper on combined gas and electricity undertakings, which Mr. J. W. Napier recently read before the North British Association of Gas Managers. As a result, it is admitted by our contemporary that the total working costs at Alloa (0·9d. per unit sold) is low. "Comparison with undertakings of a similar size operating with steam plant shows at once that the fuel cost of 0·23d. per unit is where the chief gain is to be found, though in the management also, which stands at 0·05d., there is considerable saving." But the cost of oil, water, waste, and stores amounts to 0·11d., which is more than double the figure usually found. Wages are somewhat on the high side; but repairs and maintenance are rather lower than usual. When Mond bye-product recovery plant is adopted, our contemporary anticipates a still lower cost for fuel. Mr. Napier has driven conviction home in this instance; and probably he has also disturbed the restricted views on the subject of some of those electrical engineers who think that nothing good can come out of the gas industry in the way of electricity generation and supply. Writes our contemporary from the fulness of its heart: "In the case of small undertakings, there seems to be a great deal to be said in favour of combined undertakings of this kind, as the cost of production can be reduced, and the outside staff can be employed in dealing with both electricity and gas. On the other hand, if an undertaking reaches any considerable size, it is probably better that the conflicting interests should be quite separate, for the greatest progress is generally made where there is keen competition." In what way do the interests conflict, when the linking-up of the two concerns is an economical proceeding, and when economy means an over-all efficiency, from which accrues advantage to the consumers? Instead of conflicting, the interests being combined are mutually helpful. "Keen competition" in a good many cases has not been helpful in providing sufficient for electricity concerns to put by for plant depreciation, obsolescence, and reserve; and cases are not unknown where undertakings under local authority management have had, and still have, to appeal, pauper-like, to the ratepayers for support. Where there is "keen competition," progress is not always in the direction of business and profit; it can also produce "progress" in financial unsoundness.

Linking-up Three in One.

There is another question touching this "linking-up" of gas and electricity undertakings. It has been seen that it is comparatively easy for a gas engineer to take on his shoulders the additional work of generating, distributing, and selling electrical energy. But recently various eminent central station engineers, having before them the ideal of an all-round efficiency, have expressed their views in a no uncertain way as to the participation of gas and chemical engineers when the time comes for the carbonization of coal for power-gas purposes and the development of the residual products—leaving the electrical engineer to utilize his whole energies in applying the gas to electricity generation and developing the commercial interests of electricity. There are two opposing schools of thought in connection with this particular matter. The other one is dominated by the green-eyed monster—jealousy. Those so dominated denounce the entertaining of any such views, and would force the electrical engineer to begin a new technical education in the engineering and processes of gas and chemical manufacture, and all that is technically and commercially involved. The "Electrical Review" is one of these. In connection with a comment on Mr. R. A. Chattock's address (which was noticed last week) it writes: "The electrical station engineer may view with some concern the prospect so frequently displayed before him—that he will have to add to his many accustomed activities the functions of a gas engineer and chemist. We sincerely trust that opposition to reform will not be based upon this ground. There is no inherent reason why he should shrink from such a fate. In any such large undertaking as Mr. Chattock foreshadows, there is bound to be a staff of expert chemists; and the engineer will be concerned mainly with the utilization of the gas supplied by the coal-consuming department, as at Brighton. But it would be well if electrical engineers who hope to attain eminence in electricity supply would take time by the forelock, and make themselves familiar with this branch of the subject—for the change is bound to come." That is prophetic. The gas industry is not going to sleep; and, as to Brighton, we were not aware that a final resolution had been reached in this matter. If it has, it is a case in which the plan contemplates confiding to an outside company the carbonization of coal, the production of fuel gas, and the working-up of the residual products. It does not help the argument that the electrical engineer should also be a fully qualified gas engineer and a gas chemist. At the same time, we know of gas men who are of the "one-and-all" type; and some of these have been working for years with a private electricity generating plant on their own works.

Summer Time Lighting Savings.

A Committee has lately been appointed by the Home Secretary to consider the advisability of giving permanency to the Summer Time Act. The Committee will take evidence as to the view so far held in the country as to daylight saving, its effect on social and moral conditions, and the general feeling as to the desirability of renewing and even extending it. There is no question as to what is the general view on all these points, if from the "general view" the thoughts of the managers of electricity undertakings are excluded. Some of the latter, who depend for the bulk of their business on the lighting load, have personal feelings on the subject which would not bear reproduction in print. So far as their private interests are concerned, they have no two opinions on the question regarding the desirability of giving permanency to the Act; while, as to extending its duration, they would rather not think about it at a time when they have before them the loss of revenue which the Act has been instrumental in promoting during the months of its application this year. The same, of course, applies to gas undertakings; but in their case what has been lost on the "swings" has been made up on the "roundabouts." We have noted a few additional percentages of decreased electric lighting consumption, which show that it has been heavy. The Belfast Electricity Department calculates that the private consumers have through the Act saved £1400, while the undertaking, on the other hand, has in consequence saved 250 tons of coal. The cost of this 250 tons would go a comparatively small way in providing compensation for the reduction of revenue. At Bootle, the average saving is put at 15 per cent.; at Ealing, at 22·4 per cent.; and at Edinburgh at 13 per cent. (partly due to a decrease in the public lighting). Here a saving of 600 tons of coal is represented by the diminution in lighting consumption. On the other hand there has been a large augmentation in the power supply; so that the net result is an increase in sales of 8 per cent. The Electrical Engineer of Greenock has discovered a piece of consolation. While the extra hour of daylight in the evenings has saved the consumers some of the normal expenditure of units, the additional hour of darkness in the mornings of September has been responsible for an increased lighting output of some 16,000 units. The Salford Electricity Department estimates that, in its case, the Act resulted in a reduction of £2500 in the bill for current consumed for lighting purposes. The coal saving, on the other hand, was 1100 tons. With coal at 17s. 8d. per ton, it is reckoned that the net loss to the department was, in round figures, £1500. At Tunbridge Wells the reduction in the output for lighting purposes is calculated at 21 per cent., and at Wallasey at 11 per cent.

A Doubtful Diesel Gain.

The Kingston-on-Thames Electricity Department claims a doubtful saving from the use of two horizontal Diesel engines. It is said that the engines worked satisfactorily throughout the year; the fuel cost generated being only 0·464d. per unit, against a much higher cost for steam plant—3·286d. per unit. It is best not to say anything about this steam plant, because what could be said would not be very polite. But it would be interesting to have the over-all expenses of the Diesel plant compared with an up-to-date steam or gas plant. The Electrical Engineer (Mr. J. E. Edgcome) will find in Mr. Napier's paper (referred to in a previous paragraph) that at Alloa the fuel cost with gas-engines is, although the concern is smaller, half those with the Diesel engines; and we undertake to say that Mr. Napier would not be ashamed to have his total working costs brought into comparison with those at Kingston-on-Thames. But alas! there has been an accident to one of the Diesel engines; and there is no chance of running it again before next February or March. A new crank shaft has to be fitted; and the cost of this will amount to £1000, and will have to be paid for out of revenue. How does the balance stand, placing the low fuel costs on one side and this expense on the other?

Mr. E. Arthur Bearder, M.Sc., F.C.S., has been appointed to the Bradford Technical College staff as temporary Chief Lecturer in Dyeing, in place of Mr. M. Fort, M.Sc., who has taken an industrial post. Mr. Bearder had a distinguished career as a student at the University of Leeds, where he obtained the degree of Master of Science in 1911, having previously graduated Bachelor of Science, with first-class honours in colour chemistry and dyeing. He was also awarded the University diploma in dyeing and the Leblanc Medal (1910) for distinction in colour chemistry. After two years' post-graduate research work at the University, he entered an English colour works as research chemist, and subsequently became chemist and technical traveller for one of the principal Swiss dye manufacturing firms.

A GERMAN REVIEW OF THE INFLUENCE OF THE WAR ON THE GAS INDUSTRY.

THE following is the final instalment* of the abstract translation of the Presidential Address of Herr M. Hase, of Lubeck, given before the German Association of Gas and Water Engineers at the general meeting in Berlin on June 28 last.

FAIRPLAY FOR THE GAS UNDERTAKING.

Notwithstanding the manifold advantages of gas as a fuel and illuminant, the future of the gas industry depends primarily on a rational price being charged for gas. The administration of the gas undertaking must therefore be prepared for passing sacrifices, and must be very chary of adopting measures which will interfere with the supply of gas. As a matter of municipal economics, it seems obvious that there should be no increase in the price of gas unless there is a corresponding increase in the price of current, and that the increase should be based on the increase in the prime, or works, cost of gas or electricity over the corresponding cost in pre-war times. It would be a fundamental mistake to fall into the error so frequently made in the past, of regarding the gas undertaking merely as a milch cow for the municipal chest, which can be drawn upon to make up any deficit. It should not be forgotten that new consumers of large quantities of gas, such as railway managements, barracks, &c., exercise an influence on middle-class households in favour of the use of gas which must not be under-rated. Finally, the threat of taxation hangs like a sword of Damocles over gas; and it can only be hoped that if it falls the burden will not be large, though it would be much better if the gas industry were spared taxation altogether. The German Association is ever mindful of this, and with the other representative bodies of the industry will strive to prevent any intolerable burdens being placed on it.

Gas supplies at a fixed tariff per month or quarter have been conceded only by some gas-works, and then reluctantly and subject to restrictions. The system is inequitable and inconvenient; and has proved to be liable to great abuse. In very few instances has it been pronounced satisfactory, and then chiefly on account of its service as an advertising agent. Generally it was reported to cause great waste of gas. When gas-cookers were supplied on this system, they were made to serve for the whole neighbourhood, and, surrounded with tiles, as heating stoves. It was found that the consumption of gas reached as much as five times that on which the fixed tariff was based. In the case of one works the abuse of the system as applied to gas-cookers led to the demand for gas being 65 to 70 per cent. more than in the previous years. For these reasons, the system must be regarded as applicable only to lighting burners and not to cookers.

UNIFORM AND DIFFERENTIAL PRICES.

Attempts to use a single meter for the supply of several households have been failures, as landlords find that the consumption of tenants varies so greatly that it is impossible to apportion the charge for gas supply fairly by way of an addition to the rent. The war has influenced the rates of charge for gas supplies in two opposite directions—on the one hand by reducing the cost of installing a supply; and, on the other hand, by raising directly the price of gas or imposing war levies. The tendency, observable before the war, to adopt a uniform price in place of differential prices according to whether the gas is supplied for lighting or other uses, has become more marked, though the uniform price is applied only to private householders; and technical and industrial users, large consumers, &c., obtain concessions by way of rebates, or otherwise. The Council of the German Association issued a notice last year recommending the adoption of a uniform price, on the ground that the abolition of double services and meters would be a convenience and saving, and would clearly aid the competition with petroleum.

There is now no need to encourage day consumption by charging a lower price for gas used for cooking, &c.; and it is certainly unwise to penalize the use of gas for lighting now that the consumption for lighting has dropped below that for other purposes. The ratio of the maximum consumption per diem to the annual consumption has changed from 1 to 202 in 1893 to 1 to 232 in 1913, and the ratio of the maximum output per hour to the maximum output per diem has become 1 to 10 in 1913, whereas it was 1 to 8 in 1893. In Lubeck, the day load (6 a.m. to 6 p.m.) was to the night load (6 p.m. to 6 a.m.) as 1 to 0·7 in the month of June, 1915, and as 1 to 0·8 in the month of December last. The summer load more nearly approximates to the winter; the ratio being: In 1893, as 1 to 2·1; in 1903, as 1 to 1·9; in 1913, as 1 to 1·5. All these figures show that the conditions which justified differential prices for gas have passed away.

CONCLUSION.

The effect of the war on the gas industry has only been lightly dealt with in this address. On the whole, the report is satisfactory; and the gas industry has responded well to the calls upon it. It must not be forgotten that war is a hard taskmaster; but it is in technology that the means must be sought wherewith the country's enemies may be laid low. The gas industry has fulfilled its duty in technical matters; and it only remains to express the hope that its technical men will continue, in peace as in war, to solve the problems which come before them, and thereby contribute to the welfare of mankind.

* See "JOURNAL," Vol. CXXXV., pp. 339, 436.

PODMORE'S REFLECTING CURTAINS.

IF conditions imposed by the war have restricted the opportunities in some respects of makers of gas lamps and fittings, they have at the same time given rise to new work in another direction—that is, the manufacture of shades.

On the occasion of a recent visit to the works of Messrs. A. E. Podmore and Co., in Charles Street, Hatton Garden, it was seen that the firm were very busy on the making of metal reflectors for shading both inside and outside lamps, in accordance with the regulations issued by the authorities. There is a large demand for the shades for fitting on ordinary domestic burners, as well as for other purposes. A number of these shading reflectors are listed in different sizes and patterns—to allow the light to show from one side and the bottom, from one side only, to throw the whole of the illumination downwards, &c.—but quite a feature is being made of the turning-out of special sizes and shapes to order. All are substantial in design, and neat looking; the exterior black finish giving them quite an attractive appearance. There is evidence that householders and others who may desire to have something more ornate, will find their ideas amply met by the firm.

A particularly striking sample seen in the works was a Podmore improved factory lamp, with a metal reflecting curtain, suitable for munition factories, business premises, &c., where it is desired to concentrate the light in a downward direction, to comply with the restrictions. The curtain is attached to the lamp-reflector by four pins and nuts; and the effect of its use is excellent, from the point of view of both shade and light. Although not now specially concerned with this point, it may be mentioned that the lamp to which the metal curtain was seen attached was one of the improved pattern which Messrs. Podmore and Co. intended putting on the market last year, but were prevented doing so by conditions arising out of the war. It is all copper, and made for one, two, or three burners, and it is designed with the latest devices to meet all requirements in the matter of efficiency and long life.

One other point about this lamp. It is being made in parts, with a view to facilitating packing for shipment to the Colonies, &c.; and the work of assembling is an easy matter, when the parts reach their destination. This is the sort of thing to which it is well that English manufacturers should turn their attention.

A Tar Dehydrating Plant from Scrap Material.—The Engineer and Manager of the Slough Gas Company (Mr. H. Wilkinson) was complimented by the Chairman at the half-yearly meeting of the Company [a report of which appears in another column] upon the work done by him in connection, among other things, with the erection of a tar dehydrating plant. This plant was constructed out of scrap material, at a cost of about £46, which figure includes the purchase of a storage tank of 1200 gallons capacity, The still is heated with picked pan breeze, and will deal with from 6 to 8 tons of tar per day of 24 hours.

"Truth" and the "Multicooker."—Reference to the extraordinary claims advanced on behalf of the "Multicooker" was made in "Truth" some weeks ago. The writer, in the course of his article [*ante*, p. 92], drew attention to certain tests, published by "F.W.G." in an issue of the "Bulletin of the Commercial Gas Association," and reproduced in the "JOURNAL" for Aug. 1. To summarize the whole of the results, said our contemporary, the "Multicooker," instead of saving 75 per cent. of the gas bill, increased it by 47 per cent. A Director of Multicooker Inventions, Limited, has since written to "Truth" in the hope of convincing them "that these 'tests' were incomplete, unfair, biassed, and purposely misleading." In reply, "Truth" suggests that the issue would best be settled by a further competition under conditions satisfactory to the proprietors of the "Multicooker."

THE FUEL VALUE OF COAL-TAR PITCH.

THE prevailing conditions of scarcity and high cost of steam coal naturally direct attention to the fuel value of the huge accumulations of pitch which now tend to encumber the working-up of high explosive munitions of war at coke-oven, gas-works, and other tar distilleries.

The total yearly production of pitch at the 248 tar-works registered in 1915 has been estimated at over 1,000,000 tons. With the sudden closing of the Continental market in August, 1914, and the continued restrictions on export trade—hitherto the chief method of disposal—the outlook for pitch, and, incidentally, coal tar, in the near future is extremely problematical. Prospective new outlets for use in gas and briquette making have not yet materialized to any appreciable extent, and, with the increasing demand for coal-tar derivatives which may be confidently anticipated, the possibilities of the fuel field as an outlet for surplus pitch should be critically examined.

Considered as a fuel for steam-boiler and other furnaces, pitch has distinctly attractive features. Not only is its calorific value —viz., 15,000 to 15,500 B.Th.U. per pound—higher than that of the best quality Welsh steam coal, but its present price in the Midlands and London district respectively is only about one-third to one-half that of such coal. Moreover, it is practically pure carbon, and ash and moisture free; so that in whatever proportion it may be added to other staple fuels, more than an equivalent amount of such fuel may be released for sale or export.

The relatively high price realized for pitch has in the past naturally precluded its direct use as fuel. Experience in, and special appliances of proved utility for, its use directly as fuel are therefore lacking, or at least unknown to the would-be user. Recent experiments in this direction, which have had for their object the provision of a simple and inexpensive appliance in the form of a specially-designed fire-bar, are therefore of some interest. The chief difficulty experienced in attempting to burn pitch has been the low fusing and volatilizing temperature common to all pitches, and the consequent tendency to separate carbon in the form of dense smoke. Compared with average bituminous coal containing 28 per cent. of volatile matter, pitch contains some 55 per cent.; the remainder being practically pure amorphous carbon. The claim is made that by means of this special fire-bar coal-tar pitch may be consumed in conjunction with coke with considerably less than the ordinary amount of smoke observed at the chimney of a coal-fired boiler.

The *modus operandi* which has been tried with some success in certain gas-works boilers, is to substitute a number of "pitch" bars for an equivalent number of existing fire-bars in a boiler-furnace fitted with steam-jet forced-draught apparatus of ordinary construction. Pitch, broken to any convenient size, is fed on to the pitch bars, where the heat of the surrounding fire causes it to collect and to volatilize. The rate of such volatilization is controllable by means of the special formation of the pitch bars, within limits which ensure practically smokeless combustion. The partially coked residue remaining after the more volatile constituents have been burnt off is periodically raked to the rear portion of the grate, where the combustion is completed.

THE SAMPLING OF COAL.

System Used by the United States Bureau of Mines.

THIS subject was reviewed and considered at some length in a recent issue of the "American Gas Light Journal." One of the drawbacks to the general adoption of the method of purchasing coal according to specification was the difficulty of obtaining fairly representative samples of the commercial product. The purchase of coal by the United States Government, on specification of the calorific value, ash, and moisture content, &c., rather than on the reputation or trade name of the coal, begun by the technical branch of the United States Geological Survey in 1904, was first adopted by the Treasury Department in 1906. Since that time, the adoption of the plan, with various modifications according to circumstances, had been gradually extended, and at present it covered quite one-half of the coal purchases made on behalf of the Government, the total value of which amounted to about $8,000,000 per annum. A laboratory is maintained at the headquarters of the Bureau of Mines at Washington (D.C.), where samples representing deliveries of coal for Government use are examined, sometimes as many as 1200 in a month; and a complete equipment and efficient staff ensure a considerable degree of accuracy.

The method employed is to collect portions from all parts of a consignment or delivery of coal, and to systematically reduce the gross sample obtained by mixing such portions, to the small quantities required for laboratory use, in such manner that the testing sample shall accurately represent the bulk, in respect to ash, impurities, moisture, and general composition. The gross sample should be so large that the chance admixture of slate, pyrites, and like impurities will but slightly affect the final result. Increasing the size of the sample makes for accuracy, but is limited by the cost of collection, mixing, and reduction. In the course of preparation, the sample may lose moisture; and if the price of the coal delivered is based on the composition of the "as received" sample, the result is higher than the fair value of the material at the time of weighing. Therefore it is recommended that the calorific value of the coal should always be taken on the dry basis.

The percentage of moisture in the coal, as delivered from day to day, is to a large extent accidental, and beyond the control either of buyer or seller; but as a protection against the delivery of excessively wet coal, the contractors are called upon to specify a maximum moisture content as one of the conditions of contract. The determination of moisture in coal delivered from stock piles is especially a matter of importance, as the proportion in the slack or small parts, which are particularly apt to absorb rain or melting snow, may be 10 or even 15 per cent. higher than when put into stack. The calorific value of a coal is directly influenced by the percentage of ash or incombustible matter present, which does not vary widely in coal from the same bed. But it is also largely affected by the amount and character of the free impurities; and the manner in which the fuel is prepared and cleaned in the mine may greatly influence the commercial value.

It is important to guard against accidental introduction into the sample of any extraneous matter, such as sand, cement, fragments of iron from the colliery, &c., both during the collection and preparation of the samples; and they should contain the same proportion of lump and small as the bulk, as slack may have a different ash content and calorific value from lump coal in the same consignment. The calorific value of a coal is not indicated by a proximate analysis, as the volatile matter may contain anything up to 15 per cent. of incombustibles, and also vary greatly in composition. Coals containing the same proportion of volatile matter do not necessarily behave alike in the furnace.

Recent investigations show that sulphur in the coal is not the only cause of clinkering, and coal containing as much as 5 per cent. may give no trouble. The relative proportions of iron, sulphur, lime, alumina, and silica affect the fusibility of the ash; and the method of firing and rate of combustion are important factors in the formation of clinker. One cannot definitely predict, from an analysis of the ash, whether a coal will or will not form troublesome clinker. Sometimes there are errors in working, such as slicing the fire too often, and working-up some of the ash into the hot fuel bed, where it fuses into heavy masses; and at high rates of combustion the ash may clinker more than at lower ones, because of the higher temperature.

Inexperienced persons are apt to select a sample above the average. A lump unusually free from incombustible impurities, broken up and shipped off to the laboratory in a sack, thus losing moisture during transit, necessarily gives too high a value, and a test on a single lump, which may consist of anything between pure coal and almost valueless matter, does not give a fair average. The lumps always tend to roll down to the base and the outside of the heap; so that a sample taken from one part only of the heap will not represent a fair average. An experienced collector, however, following the directions given as to the taking and preparation of samples, can get a fair representative average of the bulk.

A gross sample should comprise not less than 600 to 1500 lbs., according to the size of the lumps concerned, and especially of the pieces of slate, pyrites, or other impurities present; and the operator should be familiar with the significance of all the factors concerned, and have some practical knowledge of the coal to be sampled. The exclusion or inclusion of large fragments of foreign matter may render an analysis of a small sample worthless. The best opportunity for getting fair samples is during the process of loading or unloading, as it is practically impossible to obtain get a reliable average of the bulk from a pile or stack. While the coal is being handled, a shovel or special tool is employed to take increments of 10 to 30 lbs.; and the sample, as a rule, should be taken mechanically, without exercising discrimination as to the size of lumps, proportion of foreign matter, &c. A mechanical sampler is therefore preferable as eliminating the human element; and it should take the whole width of a stream of coal flowing down a shoot at intervals, rather than a continuous feed from one part, because the sizes and impurities are not equally distributed. It is a great assistance if the entire bulk is crushed immediately after delivery; and if it is conveyed from the crusher by a mechanical conveyor, means can be provided for mechanically and automatically diverting definite proportions in order to make up the gross sample.

Portions from a car load should be taken from all parts of the depth and from different localities in the car, either when loading or unloading, with such regularity as to get a fair average. With reasonable precautions, a sample may include the contents of several cars. If the coal is picked by hand, or otherwise treated for the removal of impurities, the sampling should be done after the final preparation. The same applies to ship loading. Perhaps in this case difficulty may be caused by the rapid flow down the shoot, which tends to reduce the proportion of large in the samples. Sometimes the collector may find it necessary to add some large lumps to the sample, or he may be able to get a better average from the overflow on the pier. In such cases, a collector having both judgment and experience is indispensable. The conditions under which the samples were obtained should be considered in the laboratory, as the collector works under some disadvantage when sampling large quantities in a short time. In sampling cargo deliveries, buckets holding 60 to 70 lbs. may prove more satisfac-

tory; and, if thought preferable, they can be at once placed bodily in a suitable lock-up and air-tight receptacle. All portions for samples should be put under lock and key, in air-tight vessels, at the earliest possible moment; and all such receptacles should be before use carefully cleansed from any foreign matter or from remnants of a previous sample.

If it is desirable to obtain an accurate determination of the moisture, special means must be adopted for the prevention of loss during the preparation and transit of the sample. It should be collected, crushed, reduced, and transferred to an air-tight case, with all possible speed, and in a cool dry place. If these precautions can be exercised on the general sample, a separate one for moisture may not be necessary; and if the collection of the gross sample extends over some days, a special moisture sample may be taken by at once transferring small portions from each increment into a suitable case, capable of containing about 100 lbs. A delivery comprising two or more cars may vary as to the moisture content in each car, and in rainy weather each day's delivery may be affected to a varying extent; so that when the collection of the gross extends over some days, special moisture samples from each car or from each day's delivery may be desirable. Necessary corrections can then be made on the gross sample for moisture.

The sample should be crushed in a mechanical crusher by preference, or, if done by hand, should be on a clean iron plate, as if spread on a brick or cement floor, splinters of it may be detached and mixed in with the sample. The crushing should always precede the reduction. The crushed coal having been made up in a conical heap, by carefully depositing shovelsful equally on all sides of the apex, a long pile is formed by taking a shovelful and spreading it in a straight line or ribbon the width of the shovel, and 5 to 10 feet in length. Each succeeding shovelful is spread on the top of the preceding one, beginning at opposite ends. The pile is then halved by shovelling to alternate sides—one side being discarded while the other is made into a new conical heap. The process can be repeated as desired; and in handling the shovel, regard must be had to the fact that the coarser fragments roll down to the base and outside of the heap, and that the centre and upper portions contain an excessive proportion of small. After a time the bulk of the sample can be further reduced by "quartering," until a quantity of about 5 lbs. is obtained, or sufficient to fill the sample container used for shipment to the laboratory.

In dealing with large consignments, a mechanical crusher that will reduce the gross samples to 3-16th mesh or lower is both expedient and economical, as facilitating the use of reducing and mixing machinery. With coal containing a considerable quantity of free impurity, it may be an advantage to use shovels smaller than the ordinary size for the quartering process, especially toward the end. As the bulk of the sample becomes smaller, greater precision in mixing and reducing is called for.

THERMAL PROBLEMS FOR GAS ENGINEERS.

XIII.

By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S.

Work Done in the Creation of a Draught.

Opinions have altered considerably within the last forty or fifty years respecting the dimensions and the height of the retort-house chimney. Formerly the preference was in the direction of lofty large horizontal section main chimneys, and, except in the case of unusually large houses, not more than one, or at most two, to each house. In many gas-works, the chimney stalks were quite a landmark in the neighbourhood. But now one looks in vain for the heavy main chimney, rising perhaps 150 feet from the ground level. In its place we find dwarf chimneys, one to each bed, carried only to a height sufficiently above the ridges of adjacent roofs to ensure freedom from trouble with down-draught when the direction of the wind is such that it strikes against the ridge, or the free distribution of the products of combustion.

There was an impression that the higher the chimney the stronger the pull, and the greater the duty per square foot of horizontal area. But this is not necessarily the case. The shape of the horizontal section, the material of which the structure is composed, as influencing conduction of heat and the cooling action of the atmosphere, are also concerned, because it is evident that the efficiency will depend on the specific gravity of the products of combustion, not at the outlet of the furnace, but at the top of the chimney, where they escape into the atmosphere. Under the best conditions of combustion, they will be heavier than air at equal temperature, to the extent of about 8 per cent. This will be corrected by an increase of temperature of about 40° Fahr. The chimney gases at a temperature of 100° will be equal in specific gravity to air at 60°, and at higher temperatures will become lighter than air, according to the laws governing the expansion of gases with increase of temperature.

A reduction of temperature at any point between the outlet damper and the top of the chimney means a loss or waste of working force. This may be due to accidental leakage of air or to the cooling action brought about by the exposure of the exterior surface to contact with the atmosphere, wind, and rain or snow. A thin wrought-iron or steel unlined shaft will therefore not be equal in efficiency or pull to one having similar internal dimensions but constructed of brick. The kind of brick used is not without some effect. A chimney lined throughout with fire-brick will be more efficient than one of similar dimensions but in which the fire-brick lining is only extended up for one-third of the height. It has been proved that a properly proportioned shaft, lined throughout with fire-brick, is as efficient, if only carried up to an altitude of 35 to 50 feet, as one rising to three or four times this height.

A round horizontal section offers the least resistance to the flow of the gases; and one advantage peculiar to the sheet metal shaft is that it can be conveniently constructed in that shape. The square form of chimney is preferred to the round when brick is the material used. It is a cheaper structure, and more congenial to the abilities of the country bricklayer; but it is not conducive to economy in working, because the flow is hindered by the formation of eddies in the corners. Matters may be improved by fixing a cast-iron cap with a round hole in it on the top of a square chimney, or by the introduction at intervals of round sections during the course of erection. I have used sections of round retorts for this purpose, with satisfactory results.

Another objection that has tended to assist the downfall of the high chimney is the difficulty of securing an equal draught on each furnace; this being disturbed by the letting down or lighting up of some of the beds. At this period of the year, it is especially tiresome if the heats are upset by this or by any other cause; and when an engineer has once had experience with separate chimneys, by which each setting is rendered entirely independent of its neighbours, he will not be likely to go back to the former plan. Sometimes it is found that the troubles formerly blamed to the vagaries of the chimney are really due to individual peculiarities in the settings themselves.

A furnace consuming 1 cwt. of coke per hour (90 per cent. pure) will require for complete combustion not less than 10·5 cwt. of air in that period, and will produce 3·3 lbs. of carbon dioxide and 8·1 lbs. of nitrogen, which passes from inlet to outlet unaltered so far as composition is concerned. The volume of these quantities, at atmospheric temperatures, will be

CO, $3{\cdot}3 \times 11\frac{2}{3} \times 8{\cdot}52 = 3{,}149$
N, $8{\cdot}1 \times 112 \times 13{\cdot}42 = 12{,}175$

Total . . . . 15,324 cubic feet.

But at the temperatures prevalent between the outer damper and the top of the chimney, this volume would be greatly increased. At 550° Fahr., it would be twice as much. If we take the bulk of the products at 40,000 cubic feet per hour, we find, on reference to a table of the discharges of gas through pipes of various diameters, &c., that a pressure of only 2-10ths of an inch of water would drive this quantity and quality of gas through a pipe 20 inches in diameter and 500 yards long. It is known that an exhaust of 3-10ths or less at the base of the chimney will suffice to secure satisfactory results in the settings. After every reasonable allowance for the obstruction offered by the bed of fuel and the baffle in the setting, we may take it that a fair working pressure is 3-10ths of an inch of water as shown on an ordinary U gauge. This is equivalent to 1·56 lbs. per square foot.

The furnace must therefore be supplied with 15,324 cubic feet of air per hour, at a pressure of 1·56 lbs. per square foot, equal to 23,905 foot-pounds, or, according to Joule's equivalent of heat, $23{,}905 \div 772 =$ only 31 B.Th.U. It is evident a temperature very slightly exceeding that necessary to counterbalance the increased specific gravity of the products of combustion as compared with air at a similar temperature would suffice to provide an efficient draught, and that under nearly all working conditions the temperature at the outlet of the chimney might be reduced to a lower temperature than is the general practice. When the products escape at 300°, we have seen that the loss so represented is about 10 per cent. of the available heat obtained from the coke. If it was reduced to (say) 120°, there would be an economy of 6 per cent. on the coke consumed, which would more than compensate for the small amount of power required to produce an artificial draught. Under some circumstances it is possible that an artificial draught would be more economical than a natural one.

Loss by Radiation and Convection.

This may be termed "leakage" of heat, corresponding to the item of unaccounted-for gas; and in order to prevent it entirely, we must be provided with a substance—whether solid, liquid, or gas does not matter—that is absolutely heat proof. A considerable advance has been made with low temperatures and on a small scale, as instanced by the thermos flask and the so-called "hay box" system of economical cooking, and also by the lagging of steam-pipes and boilers; but the writer knows of no practicable method of similar character that can be applied to structures such as retort-settings. There is every reason to believe that the loss in the retort-house from this source is of a very substantial character. The temperature in front of the retorts, or on the top of the bench, tells a story. There is a great difference in this respect even in retort-houses of similar dimensions, and containing settings of similar description, as may be observed by anyone who has occasion to visit two or three retort-houses situated in different localities in the course of a day, which may be due either to variations in the actual loss from the settings or as regards the external cooling influences. Half an hour may be spent in one house without experiencing discomfort; but in another the heat is

absolutely oppressive. The nuisance caused by choked pipes—at one time a standing grievance—is now nearly extinct, because the regenerator or other modern settings must, for structural reasons, be provided with thicker walls, which incidentally reduce loss of this nature. The modern retort-house may also claim some credit as a means of accelerating operations and reducing the time of exposure of the ironwork in front of the setting to flame and hot gases during the routine of drawing and charging.

In connection with external causes that are responsible for "leakage" of heat, we must not overlook moisture drawn into the base of the setting from the subsoil. Gas-works are usually situated in a low level, and consequently damp, locality; and possibly the advantage of an absolutely water-proof foundation up to the ground-level is not so well appreciated as it deserves. The trouble is more likely to occur in connection with houses having the charging floor at the ground level, necessitating the foundations being carried down to a depth of 10 feet or more, than in stage-floor houses, and in small works where the construction is undertaken by a local bricklayer. The work is usually carried through in the late summer, when the subsoil water level is at its lowest, and the necessity for extra expense on foundations is not apparent. This applies especially to new work, because it is easier to put down a waterproof floor and walls, of dimensions capable of accommodating the whole setting (and not the cellar only), while the site is clear than to add the same at a later period. I have known gas-works close to a brook or stream, with the cellar pit actually some feet below water level, rendering the efficient water-proofing of the foundations an absolute necessity; and there is a noticeable improvement in carbonizing results as compared with works where this precaution has not been adopted—sufficient to pay for the extra expense in a short time. There is also no risk of the periodical flooding in rainy weather that is a cause of much inconvenience and expense at many gas-works.

Internal combustion, as in a cupola, a Lancashire boiler, or a gas-engine, offers a substantial advantage in the matter of leakage of heat, because the external area of the apparatus is considerably smaller as compared with externally fired plant such as a furnace containing retorts or crucibles. With the internal combustion, the maximum temperature need not necessarily exceed the working temperature; but to ensure the satisfactory heating of a retort, the heat applied on the exterior surface must be appreciably higher in temperature than is required inside. Such portion of the flues as also forms the interior surface of the setting is likewise exposed to the excess temperature.

A carburetted water-gas set capable of producing 150,000 cubic feet of gas per twenty-hours would be as good as 22 retorts yielding 7000 cubic feet each—say, two beds of eights and one of six. Approximately the exterior surface of the former will comprise 40 feet run of cylinder, 4 ft. 6 in. in diameter and three ends—say, about 655 feet super. A bench comprising the 22 retorts would be at the least 10 feet high above ground level, 33 feet in length, and 12 feet deep. The loss of heat from the ironwork in front of the bench is obviously greater than that from the back, as evidenced by the reduced temperature that extends for several inches into the front part of the retort. But treating the front as a flat surface only, we have: Back and front, 330 square feet each; two ends, 120 feet each; top, 396 feet—total, 1296 feet super. The smaller the external area, the greater the facility for the application of lagging or non-conducting material.

We may here observe that the expression "loss of heat" is the same thing as, and a convenient expression for, "loss of the fuel required to produce the quantity of heat" mentioned, which may either be stated in absolute quantity or as a percentage. In either case, the method of representing British thermal units in terms of fuel or of cash value is obvious.

The Limit of Temperature.

This is the same thing as the working temperature required to produce the desired results (about 2000° Fahr. for the carbonization of coal) or the melting point of a metal if that is the object desired. Whatever the temperature required, the starting point is the same. Whether it is 200° or 2000°, we must start from atmospheric temperature, and work up to the degree required; and the products must leave the apparatus at not less than the working temperature. The supply of heat must be appreciably above that point. Taking this at 2000°, and the total quantity as 100,000 B.Th.U. per hour, it is obvious that the quantity of heat must be supplied at a temperature above 2000°, if efficient results are to be obtained—200,000 B.Th.U. at a temperature of 1000° will not meet the case.

The object in view is to secure the largest proportion of heat that may be practicable, at a temperature above that desired; and the higher the initial temperature, the greater the economy of the working result. If the heat applied to the exterior of the retort is at a temperature of 2220°, it is obvious that only about 10 per cent. of the heat supplied will be practically utilized. But if the initial temperature is 3000°, about 33 per cent. of the total supply may be utilized; and the production need not exceed one-third of that required in the previous instance. The initial temperature, however, must obviously be influenced by practical consideration. This source of loss can be considerably reduced by the application of regenerators, superheaters, &c., which, besides economizing on the total heat, bring in an additional saving in the form of an increased proportion above the limit of temperature referred to.

(To be continued.)

PROBLEMS ROUND ABOUT THE METER.

By Thos. Newton.

Those who have had practical experience of the old internal fitting arrangements of some houses, shops, and other premises are familiar with the amount of work that is required round about the meter before an adequate supply of gas can be assured. The matter is of some importance to the gas undertaking concerned, as well as to the consumer, in view of the fact that a restricted supply of gas cannot fail to prejudice the undertaking, not only as regards consumption, but also as regards complaints; while nothing is so calculated to exasperate a gas consumer as to be deprived of an adequate supply whenever and wherever it may be required.

An Example of Bad Distribution.

In some of the older buildings, the piping arrangements were installed before much attention was paid to the distribution problems involved; and as those responsible usually erred on the side of small pipes, it will be readily understood that a restricted supply of gas at the meter, in such instances, inevitably accentuates existing defects. One sometimes comes across a meter that has been fixed in the basement of a large and somewhat old-fashioned premises surrounded by a veritable hotch-potch of pipes, badly arranged without either thought or design. A 1-inch pipe, for example, is seen to be feeding (as best it may) two, and even three, similarly-sized pipes. A collection of branches and sub-branches proceed from these pipes in different directions (quite irrespective of how they are all to be fed) and all of them, be it understood, in the immediate vicinity of the meter. The whole arrangement furnishes a glaring example of how not to do it. Probably, two or three local tradesmen have, at different times, been responsible for additions and extensions, until confusion, becoming worse confounded, results in a restricted supply to all points; and the trouble becomes both chronic and acute.

The foregoing is by no means an exaggerated description of what is to be found, even now-a-days, in some old premises; and the sooner it is rectified, the better it will be for all concerned. Nor is the trouble exclusively confined to old premises, where the local gas undertaking does not control the work. The same tendencies appear to be manifest in newer properties which have not escaped the tender mercies and friendly attention of some irresponsible plumber.

A Suggested Remedy.

To remedy the trouble, it is advisable, in the case of an ordinary dry meter, to make and fix the meter outlet pipe in the form of an inverted **U**, one leg of which will serve as a syphon, and then to conduct the various pipes in the vicinity direct to the syphon leg—thus ensuring an adequate and separate supply to each, besides safeguarding the meter from the products of condensation. Of course, it is understood that the area of the meter outlet pipe must be at least equal to the combined areas of all the pipes that will be connected to it. In no case should the outlet pipe of the meter be smaller than the size provided for by the maker of the meter.

Technics of Fixing Meters.

In the fixing of new meters, other than wet meters, it should be the rule, rather than the exception, to make the outlet in the form of a syphon, such syphon to terminate in a ½-inch brass cap, which may be unscrewed, when required, to remove any condensation that may collect from time to time. The syphon will not only protect the meter—it will also afford a good starting point for all the independent supplies that may be necessary.

If a dry meter is to be fixed on the side of a basement wall, it should rest level on a suitable board supported by a pair of stays; but the back of the meter should not be allowed to touch the wall, particularly if the latter happens to be at all damp. The connections should be supported independently of the support afforded by the meter, and the meter should be adequately supported independently of the support afforded by the connections. This should be insisted on, since nothing is worse than a meter suspended by its own connections, unless it be the condition of things which allows the whole weight of the connections to rest upon the meter.

A wet meter, of course, needs no syphon; but particular attention should be paid to the support of this type of meter when it is fixed on the side of a wall, on account of its comparatively greater weight. The levelling of a wet meter is an important item, inasmuch as the registration will be appreciably fast or slow according to whether the meter is tilted backward or forward.

Slot Meters should Always be Accessible.

The growing consumption of gas through slot meters emphasizes the importance of fixing this type of meter where it will be most accessible both to the consumer and to the collector. To fix a meter where it is well-nigh inaccessible to the consumer who desires to put money into it, is to say the least not good business. Nor is it desirable that the collection of the money should be made under adverse circumstances that might be readily avoided.

The position of the meter seems to vary with the locality Some meters are fixed in basements, others on the ground floor, and some even near the ceilings of rooms on the ground floor. Some, again, are fixed at the front of the house; while others are

fixed at the back. Many meters are placed in cupboards; and in these cases they should always be so situated that the cash-box may be freely removed for collection purposes without imposing any strain on either the meter or its connections. Failure to comply with this simple precaution has resulted in many escapes of gas which ought never to have originated. The objectionable policy of fixing a meter so high as to be utterly out of reach without standing on a chair or a pair of steps, is amply demonstrated in these days, when women have to collect the money, just as other women have to put it in. A little forethought in the original planning of positions will often save much subsequent labour.

Changing Meters.

The ever-increasing growth in the number of those consumers who use gas for all conceivable purposes renders many existing piping installations totally inadequate to supply the volume of gas required. Hence new and independent supplies direct from the meter outlet are essential. This frequently involves the changing of a meter for a larger one; and here it is important to remember that little permanent good is effected simply by changing the meter, unless the inlet and outlet (and in many cases the service) are also changed for correspondingly larger ones. Meter unions should always be fixed inside the pipe, not outside; and if proper sizes of pipes were insisted on, the latter objectionable practice would be rendered difficult of attainment. A vicious practice in connection with the changing of meters is the forcing of unions on to meters having a different sized or pitched thread. This, however, thanks to the efforts in the direction of the standardization of meter unions, is happily becoming a thing of the past.

A New Denomination of Meters Required.

The newly-awakened spirit of industrial and commercial progress which is now so manifest on every hand encourages the hope that when things once more become normal a new denomination of meters will be attempted. Probably nothing is so singularly inappropriate nowadays as to style a meter according to the number of lights it is never intended to supply. The universality of the incandescent burner, the application of gas for cooking, heating, power, and industrial purposes generally, all unite to demonstrate the unsuitability and futility of the present definition. It would certainly be more intelligible to denominate a meter as being capable of delivering 25, 50, 100, 200, 300, 400, 500, &c., cubic feet per hour. After all, this is the basis upon which meters are nowadays fixed; and no useful purpose is served by the makers first transposing cubic feet per hour into number of lights *plus* a considerable margin, when it is generally known that a re-transposition has to be made before the meter is fixed. Possibly this is one of the little things that has been overlooked. But progress is now the order of the day; and no progressive industry can afford to tolerate for an indefinite period anything that is obsolete, or that has obviously outlived its usefulness.

COKE-OVEN MANAGERS' ASSOCIATION.

The Annual General Meeting of the Coke-Oven Managers' Association was held at the Grand Hotel, Sheffield, on Saturday, and was largely attended. Mr. George Chrisp (the President) occupied the chair.

A Vote of Condolence.

The Chairman, in opening the proceedings, said his first duty was a sad one. He had to ask them to join with him and the Council in a vote of condolence with the relatives of a member who had died in harness—Mr. Corner, of the Northern Section and the Dean and Chapter Colliery, who had been killed on the works.

The members gave expression to their sympathy by rising in their places.

Officers of the Midland Section.

The ballot for the officers of the Midland Section resulted as follows:

Chairman of the Section.—Mr. G. Chrisp.
Secretary.—Mr. G. H. Lant.
Committee.—Messrs. J. T. Price, P. B. Nicholson, J. W. Lee, B. W. Haigh, F. Hadfield, and J. H. Wilson.

The Past Year's Work.

The President said the next business was a report of the work done last year; and it was understood that this was to be a brief *résumé* by himself. It was well known to any member of a scientific association that the first year of the life of such an association was usually a very strenuous one; and their Association had not been any different from others in this respect. The rules had been a source of constant trouble; and they were not through with the trouble yet. They had instituted for the past year a system of papers and visits which had been well patronized, and proved useful, instructive, and interesting; and he thought they had been greatly enjoyed by the members who had had the privilege of attending. Of the papers, some had been good, some moderate, and some excellent; but he was quite sure that, on the whole, they had had a very interesting series indeed. They hoped that, in the coming year, even better papers would be given. This, of course, depended upon themselves. Then there was the question of the Year Book. Unfortunately, at the moment this was not quite finished. The Council hoped to get it out by Jan. 1 next. There were some matters on which little difficulties had cropped up; but the book was going to be a thing of which they all ought to be very proud, and it was going to be very useful indeed to them in their work. The balance-sheet showed that the Association finished up the year with nearly £60 in hand. This was a matter on which the Council ought to be congratulated, and of which they all ought to be proud. As the members knew, they had formed sections throughout the country—the Northern, the Midland, the Western, and the Southern sections. When the Association was first formed a year ago, it was simply started with the idea of covering the Midland district; but it had grown and become a national affair, and they had had enthusiastic support from every district in the country. This had entailed a good deal of alteration in their rules. At the present moment they had 90 full members, 44 associates, and 11 honorary members—a total of 145. With very few exceptions the Association now had members from nearly every coke-oven plant in the country; and he had no doubt that they would get the remainder in in course of time. What had already been done was, he thought, something that the Council might be proud of.

The Hon. Treasurer (Mr. B. Wilson Haigh), in presenting the balance-sheet, said it was very gratifying to him to find that they had a balance of practically £60 in hand at the end of their first year's working. This might not be quite so favourable in coming years, because there would be sure to be expenses which had not had to be met in the first year. All the expenses of the delegates up to now had been paid by themselves. The expenditure on the dinner was a good deal more than the income; the actual monetary loss being £8 17s. 6d. They had entertained a number of friends and Press representatives; and they did not think that the money had been badly spent. The other expenses were just such as were bound to occur in the working of an association; and he did not think that they called for any special comment. He moved that the statement of accounts, as examined and passed by the Auditors, be accepted and approved.

Mr. Lee asked whether it was the intention of the Treasurer to put before them the statement of accounts up to Sept. 30 last, after the present one, which was dated 1915.

The Hon. Treasurer said the year really ended in July, 1916. These accounts were really for fifteen months, because the periods got so involved that it was impossible to separate them. The next balance-sheet would be from Oct. 1, 1916, to July, 1917. The year 1915 on the printed copies of the balance-sheet was a printer's mistake. It should be Sept. 30, 1916.

Mr. Lee asked whether the subscriptions for 1916 were included in the balance-sheet.

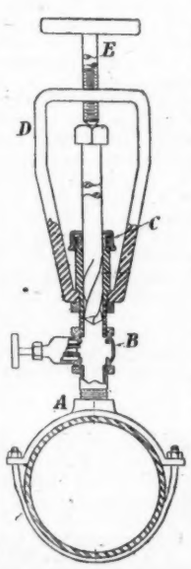
The Hon. Treasurer said there were three or four subscriptions which overlapped the two years. When they formed the Northern branch the Council decided that those who came in at the end of the year should have the privilege that their subscriptions should go forward for 1916. Perhaps half-a-dozen or so of subscriptions had been paid on that footing; but the subscriptions which were directly for 1916-17 were not included in the present balance-sheet.

The balance-sheet was passed on the motion of Mr. G. H. Lant.

Rules of the Association.

The President then announced that the discussion on the rules was to be dealt with in private session, and that the rules as approved would be supplied to the Press in due course.

TAPPING HIGH-PRESSURE MAIN-PIPES.



Tapping High-Pressure Mains.

A simple form of apparatus, specially designed for use on natural gas lines, but equally applicable to any high-pressure main, is described by the National Gas Association of America. It comprises a short double collar of steel, of such diameter as to allow the easy passage of the drill, fitted with a stuffing-box, and cap for protecting same when not in use, a twist drill with square head to take a ratchet spanner, and a steel yoke with feeding screw.

The method of using it is as follows: A saddle clip A, with tapped nipple, is first secured permanently in position on the main pipe. A gate-valve B, with male connections, is screwed into the nipple; and the drilling machine is attached to the valve. This being shut, the cap C can be taken off at the stuffing-box end, and the drill introduced. The valve is then opened, and the drill passed through into position—all escape of gas being prevented by the stuffing-box. The yoke D and feeding screw E are put on to the drill, and the hole made. This operation being complete, the drill is pulled up clear and the valve closed. The machine is removed, and the service or connection can be made at convenience, and without any escape of gas.

The method appears to be useful where the commandeering of a valve for each service is not an objection.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

Autumn General Meeting in Birmingham.

Members of the Association met last Thursday afternoon in the Grand Hotel, Birmingham, under the presidency of Mr. CHARLES H. WEBB, M.Sc., Assoc.M.Inst.C.E., of Stourbridge. The papers which were read gave rise to good discussions; and the only regret in connection with the meeting was the enforced absence, owing to indisposition, of Mr. John Bond, of Southport, who had promised some further notes on oil-washing.

The HON. SECRETARY (Mr. W. G. S. Cranmer, of Willenhall), at the opening of the business, read the minutes of the previous meeting; and they were confirmed. He then read a response from Mr. Corbett W. Woodall to the letter of condolence which had been addressed to Lady Woodall. Also several apologies for absence from the meeting.

NEW MEMBERS.

The following were admitted as members of the Association, on the proposition of Mr. J. F. BELL (Derby), seconded by Mr. W. H. ADAMS (Bilston): Mr. John Bond, of Southport; Mr. F. C. Briggs, of Dudley; and Mr. J. H. Willoughby, of Brownhills.

ELECTION OF OFFICERS.

The PRESIDENT (Mr. C. H. Webb, of Stourbridge) said the Committee had, as usual, received no nominations in response to their invitation; and they had therefore prepared the following list for the approval of the members:

President.—Mr. George Stevenson, of Long Eaton.
Vice-President.—Mr. W. Chaney, of the Saltley Gas-Works, Birmingham.
Hon. Treasurer.—Alderman W. R. Cooper, of Banbury.
Members of Committee (to replace those retiring in rotation), Mr. B. Ely (Pye Bridge), Mr. F. L. Wimhurst (Newcastle-under-Lyme), and Mr. S. T. Smith (Malvern).
Hon. Auditors.—Mr. E. Parker (Oakengates) and Mr. W. M. Valon (Stafford).
Hon. Secretary.—Mr. W. G. S. Cranmer, of Willenhall.

Mr. W. C. JONES (Brierley Hill) proposed, and Mr. W. S. MORLAND (Gloucester) seconded, the election of these gentlemen.

The resolution having been heartily agreed to,

Mr. STEVENSON said he was much obliged to the members for electing him to the Presidential Chair; and he would do everything he could for the Association in his small way. It seemed almost as difficult to persuade members to take office as to read papers.

THE PAPERS.

Some "Notes on Purification" were then read by Mr. W. C. JONES (Brierley Hill); while Mr. R. S. RAMSDEN (Burton-on-Trent) and Mr. W. M. VALON (Stafford) dealt with the subject of "Municipal Profit-Sharing." The papers, and the subsequent discussions upon them, will be found elsewhere in this issue.

The authors were cordially thanked for their contributions, on the motion of Mr. MORLAND, seconded by Mr. ADAMS.

OIL-WASHING.

The PRESIDENT said that Mr. John Bond, of Southport, who was to have given them some further notes on oil-washing, had written to say that indisposition would prevent him from attending the meeting. Mr. Stevenson, of Long Eaton, who was the officer for the district on toluol extraction, would, however, he thought, probably be able to get from Mr. Bond a short description and a sketch of the method and apparatus to which he had intended to refer; and if so, they would try to circulate it among the members. Continuing, the President said Mr. Glover, of St. Helens, had written a letter in which he said, on the subject of oil-washing, attention should be called to the importance of securing a suitable oil for washing purposes, as a great deal of trouble had been caused by some oils having been supplied for the purpose which, while of the standard specific gravity, were only so because of being loaded-up with naphthalene in solution. He (the President) thought they were to a great extent aware that it was necessary, in asking for a washing oil, to specify the maximum proportion of naphthalene that it should contain.

MIDLAND JUNIOR ASSOCIATION.

The PRESIDENT pointed out that members of the Association were invited to attend the opening meeting of the session of the Midland Junior Gas Association, at which their presence would be much appreciated.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

BENZOL RECOVERY AT WOMBWELL.

Apart from the healthy condition of the Manchester District Institution of Gas Engineers generally, doubtless the pressure by the Ministry of Munitions on gas engineers to turn still greater attention to the extraction of benzol was largely responsible for the big party—numbering not far short of 200—which, on the occasion of the 176th quarterly meeting of the Institution, last Saturday, visited Wombwell, which was the first among the smaller gas undertakings to seriously tackle this work. With the hearty co-operation of the Wombwell Urban District Council and the Gas Committee, together with Mr. P. D. Walmsley, B.Sc., the Engineer, Mr. J. E. Mitchell, of the Mitchell Main Collieries, and Mr. H. A. Morley, the Coking and Bye-Product Manager at the collieries, the affair was a notable success. Every facility was offered whereby the visitors could secure a thorough insight into the benzol extraction operations both at the Council's gas-works and at the Colliery Company's coke-oven plant. The arrangements for the comfort of the party were entirely in keeping with the Yorkshire reputation for hospitality. Wombwell is not the most accessible of places; and recognizing this fact, the hosts of the day had arranged that the guests should be met by motor buses at Barnsley Railway Station to carry them the remaining four miles, in lieu of an inconvenient war-time railway service direct to Wombwell. At the Wombwell Town Hall, the Council provided light refreshments at noon; and a little later, after a visit to the gas-works, a sumptuous luncheon was served, through the generosity of the Mitchell Main Colliery Company, at the Wombwell Reform Club.

AT THE GAS-WORKS.

The visit to the gas-works was under the guidance of Mr. P. D. Walmsley, the Engineer and Manager, where the visitors were able to see the crude benzol recovery and rectification plant in operation. Mr. Walmsley briefly explained the processes, in order that the guests should the better understand a paper on the subject to be read later in the day. He also fully demonstrated the works' tests described in the paper. He said in benzol washing it was most important one should know what there was in the gas before washing, and what was left after washing; and for the purpose of testing, a series of wash-bottles was used, containing 400 c.c. of creosote oil, on which a blank test had already been made. He proceeded to show the course of the test, as described in detail in the last few paragraphs of the paper. These tests, he said, were not strictly scientific. They did not find actually either the crude benzol or the finished product, as it had still 10 per cent. of creosote oil in it. It was simply a measure of it, by which one could tell where one stood day by day. As a works' test the process quite sufficed, because if they measured from 10 cubic feet of gas it was easy to calculate what it was from the 10,000 cubic feet content per ton of coal. The second test on the finished gas would tell what was left in the gas. There were two ways of testing for the crude benzol. The strictly scientific test would be by means of the bulb; but the ordinary works' test was by means of an ordinary 200 c.c. retort with the thermometer $\frac{3}{8}$ inch from the bottom—the process being practically similar. The benzol, of course, was always spoken of as benzol at 120°. A method which would give a higher test was one with the thermometer not in the liquid, but instead just opposite the side tube—that was, in the vapour, which would naturally give a higher value of benzol than the former test. In answer to a question as to how much higher would be the value, Mr. Walmsley said a 65 per cent. benzol would give 70, 71, or 72. It all depended upon the character of the benzol. In one test, they were measuring the temperature in the vapour, and in the other in the liquid.

A member asked if 65 per cent. was indicated at 120° with the thermometer in the vapour, would it follow to the extent of 10 per cent. in the retort?

Mr. Walmsley replied that it might easily do so; it depended a good deal on the character of the different distillates which came over at different temperatures. Two 65 per cent. benzols might give different distillates at 10°, 100°, or 110°, though the final result at 120° might be the same in both cases. There was no fixed percentage.

After other questions of detail had been asked and answered, the party left the gas-works.

SPEECHES AT THE LUNCHEON.

The PRESIDENT OF THE INSTITUTION (Mr. Edward A. Harman, M.Inst.C.E., of Huddersfield) presided at the Reform Club.

The loyal toast having been honoured,

The PRESIDENT called upon Mr. F. L. Halford, of the High Explosives Department of the Ministry of Munitions, for a few remarks.

Mr. HALFORD, who was cordially received, said that in having asked him to say a few words on the importance of benzol recovery, they asked him to say something not only of which they all knew, but on which, he hoped and believed, they were all in agreement. Everybody knew the importance of explosives at the present time, and that without toluol and benzol they could not have the explosives. Nobody would deny that it was quite impossible to have too many shells, and therefore too much benzol. It was questionable, indeed, whether it was possible to have enough. The importance of benzol must be clear to the dullest imagination, without any further enlargement on the matter by him. It followed, therefore, that any one of those present who had it within his power to do more than he was doing to assist in the production of benzol was failing in his duty not only to his country, but, according to his (Mr. Halford's) idea of morality, to the gas consumers themselves, until he did his utmost. They must not permit any disinclination to do more because of fear of, or consideration for, the consumers. It was the first concern of the country to win the war; and therefore this was the first concern of the consumers. If the consumers were fully aware of the facts, he was sure the number of complaints about poor gas as a result of debenzolizing would be far less. ["Hear, hear," and laughter.] From what was heard in some quarters, one would almost imagine that there had never been any complaints about poor gas before benzol began to be extracted. [Laughter]. If there were any gentlemen present whose works were suitable, and who had not yet made a move in this matter, he thought they must not have come there that day so much in the interests of benzol recovery as by the attraction of the great reputation for hospitality of Mr. Mitchell. [Laughter]. Were they all doing their best? Were they fighting against time to bring their plants up to the standard required for the needs of the time; and if they had reached this standard, were they doing their utmost to get out the last possible drop of benzol? It was not from lack of appreciation of the work of many of the gas engineers that he spoke thus. Many of them had shown how fully aware they were of the importance of benzol recovery; and it was not for him to come there and dwell upon it. All the men doing this well understood the urgency, and they knew what was at stake. In conclusion, he wished to confess that two years ago he had never heard of Wombwell. But the war had had varying effects on them all; and, so far as he was concerned, interest and activity in benzol recovery had quite superseded size of place in regard to real importance at present. Judged by this standard, Wombwell was in the foremost rank. Wombwell, with a Council and Gas Committee such as it had at the present time, was, though only a small place, a force to be reckoned with and to be relied upon in the present need of the country. [Loud applause.]

The PRESIDENT, in calling upon Mr. Doig Gibb, of the Ministry of Munitions, said Mr. Gibb was such an old friend of the Institution that no introduction was necessary.

Mr. DOIG GIBB, who received a warm welcome, said it was true that he was now directly connected with the Ministry of Munitions, as they knew; and in this way he was doing, he hoped, his duty to the country just as he trusted the gas engineers generally were doing theirs. It was a great pleasure to him to meet his old Manchester district friends again. He did not think he could intrude upon the part of the subject so ably treated by Mr. Halford. He would limit himself therefore to a strong appeal to gas undertakings to make use of the Calorific Standard Act. An application under the Act ought not to be looked upon as a difficult thing by any company who were conscientiously oil-washing. If application were made, the company's needs would be met as far as ever possible, and without any undue expense to the undertaking. They in the South were doing their bit; though, as in the North, they had some laggards. But they hoped that in the South and in the North and the Manchester district there might very soon be no laggards at all.

Mr. CHARLES WOOD (Bradford) then proposed the toast of the Wombwell District Council, Mr. Allott (its Chairman), the Mitchell Main Colliery Company, and Mr. Mitchell. If it were true, he remarked, that there were any members who had come there that day more for the hospitality promised than in search of guidance for the extraction of benzol, he felt sure that the country would benefit even from those members having been brought there and having seen the benzol plant at the gas-works and the plant which they would presently view at the colliery. The Wombwell district —with Mr. Mitchell, Mr. Walmsley, and Mr. Morfey—had set an example to all the smaller gas undertakings in the country. He did not know what they had done so far as productive figures were concerned; but he did know that for some time past they had done everything they could to get every possible drop of benzol out of their gas.

Mr. ALFRED E. ALLOTT (Chairman of the Wombwell District Council), in responding on behalf of his Council, said he had been connected with the Council and the gas-works for some years, and he had seen the works rise from chaos to their present condition —from an undertaking which had to be fed from the rates to one which, during the last few years, contributed many thousands of pounds to the relief of the rates. The members of the Gas Committee took no credit for this, but gave it all to their capable Gas Manager, Mr. Walmsley. They had (and he thought wisely) practically left him to "boss the show." They met every month just to let him know that they could interfere if ever they liked [Laughter]; but as he presumed most gas committee members really knew very little about gas, he was sure the best policy was to give great freedom of action to the man who did understand. In Wombwell, at any rate, this policy had worked well, and they were satisfied. He was proud to think that Wombwell was the first Urban District Council in the country to go forward with this benzol recovery work. He hoped the engineers present that day would all go back fully determined to get their gas committees to put down benzol plant. It was a matter of national duty; and also he would like gas men to be able to say, after the war, that they had taken no little part in the winning of the greatest war the country had ever been engaged in. His own Council, when asked to put down the plant, never suggested whether or not it would pay them or what it would cost, but simply said, "If it will do any good, go on with it." Their thanks were greatly due to the energy of their Manager and of Mr. Mitchell, who had co-operated in a most valuable degree.

Mr. J. E. MITCHELL hoped that gas engineers would do all they could to help forward this work. If what they were shown that day at Wombwell would help any man present in the installation of benzol-recovery plant, Wombwell would have had its reward. The township was proud to have the Manchester District Institution down there to see what they had done. He had to thank Mr. Allott and the Council for the kind way in which they had always treated his own concern, and the work of benzol recovery at the gas-works. They had simply said, "If it is for the good of the country, go ahead." They only hoped that the committees of the engineers present would show the same consideration as the Wombwell Committee had shown to Mr. Walmsley and himself.

Mr. WALMSLEY said some of those present might have good gas committees and good chairmen, but none of them had better chairmen or committees than he had—probably not so good. They were ideal; they never interfered. [Laughter.] If Wombwell could help any engineers at any time after that day in benzol recovery, they would be only too glad. If all of them in their bigger works were doing in proportion to their size what Wombwell was trying to do, the visit would have proved worth while.

The party then travelled by motor buses to the Mitchell Main Colliery's coking and bye-product plant, where there are forty Simon-Carvès ovens erected in 1907, and five, slightly improved, constructed four years later. The slack is brought from the washery on the colliery site a quarter of a mile away, by means of an aerial bucket conveyor. For some little time the compressor has been out of order, and the charging of the ovens has been by hand—200 to 250 tons per day being consumed. A feature which is not found on every coking plant was the system of disposing of the discharged coke, through loading holes in the flat discharge bench, direct into railway trucks on the line underneath the bench. The gas proceeding to the bye-product plant is cooled by a serpentine water cooler. Under the guidance of Mr. Walmsley and Mr. Morfey (the Coking and Bye-Product Manager), the visitors witnessed similar operations to those at the gas-works, but on a larger scale. The direct process is in operation here; and, of course, the guests were able to see the work of benzol recovery fractionated into the products which are not obtained at the gas-works plant. At the coking plant, as at the gas-works, the yield of benzol is 2¼ gallons per ton of coal.

THE BUSINESS MEETING.

The motor buses then carried the party back to Wombwell, where, in the Lecture Hall of the Carnegie Library, the business meeting was held.

The PRESIDENT occupied the chair, and was supported on the platform by Mr. W. Whatmough (Heywood), President-elect, Mr. James Braddock (Radcliffe), Hon. Treasurer, Mr. G. S. Frith (Runcorn), the Hon. Secretary, and Messrs. Walmsley and Morfey.

The SECRETARY read several letters of regret, including one from Mr. J. G. Newbigging, Past-President; and on the motion of Mr. E. H. HUDSON (Normanton), seconded by Mr. J. H. BREARLEY (Longwood), a telegram of sympathy in his indisposition was dispatched to Mr. Newbigging.

Lady Woodall, Mrs. W. H. Nutter, and Mr. R. W. Nuttall sent letters of thanks for the Institution's sympathy in their bereavements.

The following new members were elected: Mr. Frederick Bowen, M.Sc., Gas and Water Engineer, Leigh; Mr. Mark Newsome, Gas Engineer, Tyldesley; Mr. Frederick A. Price, Superintendent of the Manchester Gas Department; and Mr. Harold Singleton, Gas Engineer, Huddersfield.

Mr. P. D. WALMSLEY, B.Sc., then read the following paper, prepared by himself and Mr. H. A. MORFEY.

SOME NOTES ON BENZOL RECOVERY AND RECTIFICATION.

The object of this short paper is to describe, from a practical standpoint, the present practice in the recovery of crude benzol from coal gas, in gas and bye-product coke works, and the subsequent rectification of the crude benzol to finished products. It is intended to keep the paper of very modest dimensions, so as to allow ample time for a subsequent discussion, such as the

importance of the subject at the present time demands. No attempt is made to deal with the scientific side of the question, as this may well be left to abler pens; but if the paper should prove of slight assistance to members who may be contemplating the installation of a benzol-recovery plant, the object of the writers will have been attained.

Historical.

The extraction of hydrocarbon vapours from coal gas is not new. Caro, as far back as 1869, obtained a patent for the absorption of them in heavy oils or naphtha; and in 1882 Josiah Hardman's patented process, "for the extraction of benzol from coal gas by the use of creosote or tar oils," was in use at Miles Platting, Manchester—using gas purchased for the purpose from the Manchester Corporation. The success of the process led to its being used under royalty by the Whitwood Chemical Company at their works at Normanton.

In 1882 George E. Davis also patented and worked on the large scale a benzol-recovery plant at Messrs. Newton, Chambers, and Co.'s works, Thorncliffe, near Sheffield.

It may be mentioned that at that time (1882) benzol was about 15s. per gallon.

Sources of Benzol Recovery.

Previous to the commencement of the war practically the whole of the benzol produced in this country was obtained from bye-product coke-ovens; and a present estimate of the supply from this source is about 38 million gallons per annum. The coal carbonized in gas-works would point to a potential yield of about 60 million gallons per annum, assuming the extraction was general and complete.

As to the future of benzol-recovery on gas-works after the war, everything, of course, depends on the attitude of the Government and future legislation; and if this is favourable the demand for benzol as a motor spirit will be quite equal to the potential supply, and benzol recovery would form part of the ordinary routine of a gas-works.

Methods of Extraction. Choice of Extracting Medium.

The usual apparatus in use for the extraction of ammonia from coal gas is suitable for the extraction of crude benzol. Livesey washers, tower scrubbers, or mechanical rotary scrubbers, are all suitable types of plant; but an important point to bear in mind is that washing with the extracting oil should take place after the gas has been cleared of ammonia. Otherwise the greater part of the ammonia left in the gas at the point where the oil-washing takes place will be lost, owing to the absorption by the wash-oil; and although no statistics can be given, it must be obvious that the benzol absorbing capacity of the wash-oil will be reduced.

The extracting medium generally favoured is creosote oil obtained in the distillation of coal tar, the specific gravity of which is usually from 5° to 9° Twaddel. It should be as free from naphthalene as possible, and can be obtained with so low a naphthalene content as not to deposit more than 5 per cent. by weight when the distillate from 200° to 300° C. is cooled to 45° Fahr., and maintained at this temperature for thirty minutes. Further, it should be quite free from water.

Anthracene oil or "green" oil is also a suitable medium for use after having the anthracene removed by filtration or settlement. Shale oil and blast-furnace creosote, we believe, have also been used for this purpose.

The following is a representative test of a suitable creosote oil:

Test on Retort with Bulb of Thermometer Immersed in Liquid.

Specific gravity	1·035
Dropping point	210° to 220° C.
50 per cent. distils over at	250° C.
80 " " "	300° C.
Water content	Traces

On cooling the distillate obtained up to 300° C. to 45° Fahr., and maintaining this temperature for thirty minutes, the solid naphthalene settling out, on being filtered and pressed, should not amount to more than 7 per cent.

Quantity of Extracting Medium, Degree of Saturation, and Temperature of Gas and Oil.

The amount of wash-oil to be debenzolized in the stills per ton of coal carbonized depends entirely upon the degree of saturation of the benzolized oil, which in turn is governed by the efficiency of the oil-scrubbing plant. An average degree of saturation would be about 3 per cent., which means that for every ton of coal carbonized (assuming a yield of 3 gallons per ton) the oil to be debenzolized would be 100 gallons; and if 4 per cent. saturation is aimed at, the oil would be 75 gallons. The loss of creosote oil in distillation is approximately one-fifth of the crude benzol recovered.

It is important that the oil for washing should be as free from water as possible, as the presence of water considerably reduces its absorbing capacity. The presence of water in the oil may be due to:

(1) Water carried over in mechanical suspension in the gas from the scrubbing apparatus immediately preceding the oil-washing apparatus.

(2) Water deposited in the oil, due to the temperature of the gas being reduced in the oil-scrubber. From this it follows that the incoming oil should be at a slightly higher temperature than the gas.

(3) In steam-heated stills, water which may be condensed in the oil by defective working of the still, due to (*a*) the supply of steam being in an insufficiently dry state, (*b*) condensation of steam in the still due to low temperature of entering oil.

(4) Lastly, there is the water which may be present in the oil when purchased.

Choice of Method of Distillation of Wash-Oil.

There are two methods of dealing with the benzolized oil when obtained:

(1) The direct-fired still, the heating of which may be by solid or gaseous fuel.

(2) The steam-heated still.

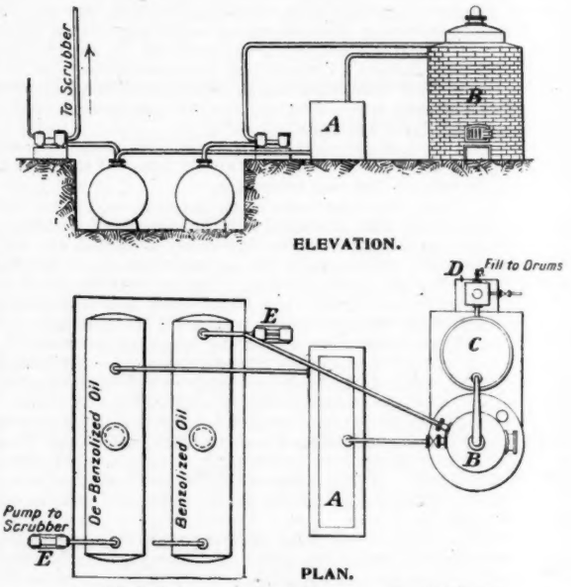
In the choice of the type of still much depends on the amount of oil to be dealt with. For small makes up to (say) 50 tons of coal carbonized per day, the direct-fired still is preferable, inasmuch as it is cheaper to instal, and if necessary it can be adapted to tar dehydration. This point will appeal to members in charge of small works, where the amount of coal carbonized per day would hardly justify the installation of two separate plants. Its disadvantages may be summed up in its control, which necessitates constant attention in the firing, though in cases where the still is fired by gaseous fuel this would be considerably reduced.

For makes of over 50 tons of coal carbonized per day, the steam-heated still is to be preferred, owing to its ease and efficiency of control, in addition to its practically automatic action, which necessarily means small labour cost in operation. It is remarkably flexible; and its efficiency is not impaired when dealing with quantities of wash-oil between wide limits. The space occupied is small. A complete plant (excluding storage tanks) capable of dealing with the benzolized oil from 300 tons of coal carbonized per day can be erected on a site 20 feet square. The cost, also, as the size of the plant increases, does not increase to such an extent as the cost of the direct-fired plant.

General Description of Plant of the Wombwell Gas-Works Type.

[See Fig. 1.]

The wash oil after being circulated through the washing apparatus passes into the benzolized oil-tank, whence it is pumped by the pump E into the still B, where it is heated by direct fire. After having been denuded of its benzol, it passes through the oil cooler A (which may consist of a series of wrought-iron pipes,



A. Oil Cooler. B. Still. C. Condenser.
D. Separator. E. Pumps.

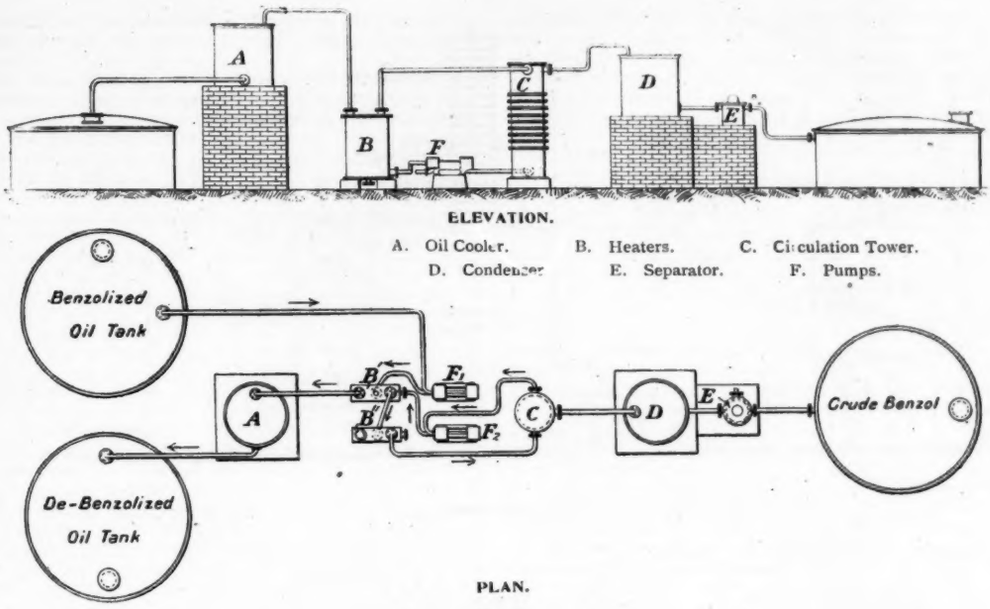
Fig. 1.

either immersed in a tank of water or sprayed by suitable jets); and thence it passes to the debenzolized oil-tank for use again. The benzol vapours pass through the still-head into the condensing coil C, where they are condensed to the liquid form, and then pass into the separator D, where any water which may be present is separated. The crude benzol is then either loaded direct into drums or led to a crude benzol storage tank.

General Description of the Steam-Heated Still as in Operation at the Mitchell Main Colliery.

[See Fig. 2.]

The wash-oil, after being circulated through the washing apparatus, is pumped from the benzolized oil tank through the exchange heater B^{I}, in which it is heated by the debenzolized oil leaving the still. Thence it passes to the preheater B^{II}, where it is further heated and then passes on to the still C. Entering the



ELEVATION.

A. Oil Cooler. B. Heaters. C. Circulation Tower.
D. Condenser. E. Separator. F. Pumps.

PLAN.

Fig. 2.

expansion chamber at the top of the still, it gravitates downwards in a circuitous path from tray to tray to the base of the still, meeting in its passage downwards the ascending steam. From the base of the still it is pumped by the pump F_2 (which is arranged to automatically synchronize with the pump F_1, so that the contents of the still base are maintained at a prearranged level) through the exchange heater B^1, and the oil-cooler A, and so to the debenzolized oil-storage tank for use again.

The benzol vapours and steam leave the top of the still C by the pipe shown, and pass into the benzol condenser D; and thence into the separator E. This separator is of special design, whereby the flows of the mixture of benzol and water, separated benzol, and water alone, may be observed. In addition, all the apparatus is gas-tight, thus ensuring perfect safety in working. From this separator the benzol flows to the benzol storage tank for subsequent rectification.

The steam supply to the still should be perfectly dry, and at a pressure of not less than 40 lbs. per square inch. It is, of course, obvious that the higher the pressure (within limits) the more economical will the steam consumption be. In a recent test on a plant dealing with the wash-oil from 200 tons of coal per day, with steam at 70 lbs. pressure, the steam consumption was at the rate of 66 lbs. per 100 gallons of oil treated.

Definition of Product.

The product obtained from the distillation of the oil in the manner described is what is commercially known as "65's Crude Benzol," by which is meant that if 100 c.c. are distilled in a glass retort with the bulb of the thermometer immersed in the liquid, 65 c.c. will pass over up to 120° C.

Rectification of Crude Benzol.

The rectification of the crude benzol obtained in the crude benzol plant consists in the chemical washing of same for the removal of impurities—mainly sulphur compounds, phenoloid bodies, and pyridine—and subsequently distilling the washed product and collecting the distillate in fractions, which are afterwards mixed to approximate to the following tests:

For Standard Benzol.	Test on Wurtz flask with bulb of thermometer in vapour just below side tube. First drop at about 80° C. Not less than 95 per cent. over at 90° C.
For Toluol	Test on Engler flask with bulb of thermometer in vapour just below side tube. First drop at about 100° C. About 20 per cent. over at 105° C. " 90 " " 117° C:
Solvent Naphtha . .	Wurtz flask as described for benzol. First drop at about 132° C. 90 per cent. over at 160° C.
Heavy Naphtha. . .	On retort with bulb of thermometer immersed. First drop about 160° C. 90 per cent. over at 190° C.

Previous to the war, the commercial tests obtaining were as follows:

90 per Cent. Benzol . .	First drop about 80° C. 90 per cent. over at 100° C.
50-90 per Cent. Benzol .	First drop about 90° C. 50 per cent. over at 100° C. 90 " " 120° C.
Toluol	First drop about 100° C. 90 per cent. over at 120° C.
Solvent Naphtha . . .	First drop about 130°—135° C. 90 per cent. over at 160° C.
Heavy Naphtha	First drop about 160° C. 90 per cent. over at 190° C.

All these pre-war tests were made on the retort with the bulb of the thermometer immersed in liquid.

General Description of a Rectification Plant and its Operation.

[See figs. 3 and 4.]

The crude benzol is pumped from the crude benzol storage tank through the pipe A into the agitator B. This agitator usually consists of a wrought-iron lead-lined, or cast-iron vessel of about 1200 gallons capacity. The agitator is provided with a stirring device which may be actuated by any convenient source of power; but if the source of power is an electric-motor or gas-engine, it should be housed in a separate building, and the power transmitted by shafting. At the bottom of the agitator is a waste cock C, for drawing off the spent washing materials.

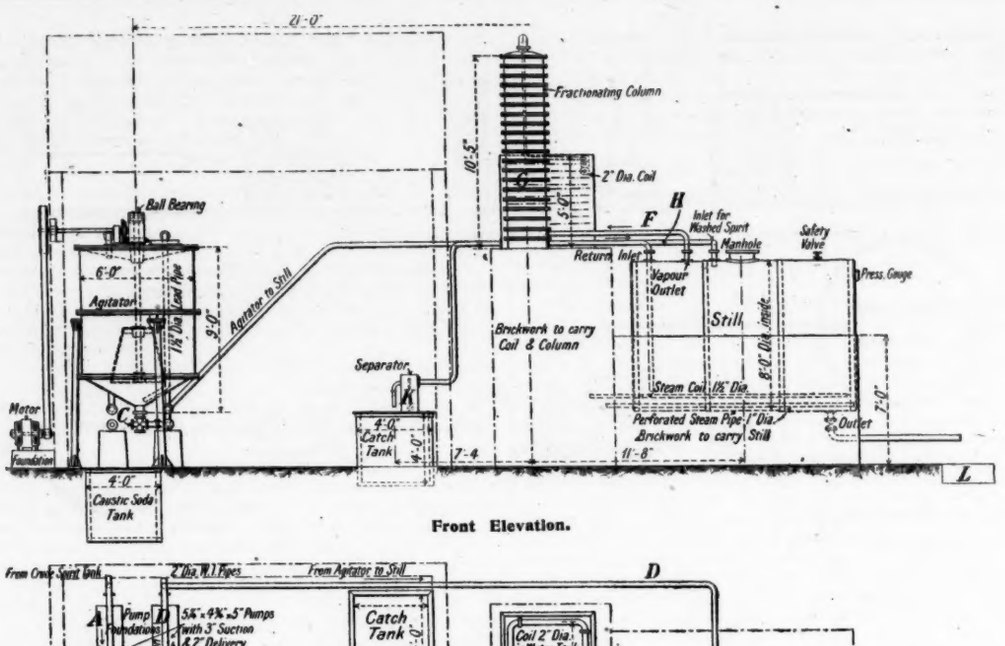
The crude benzol is fed into the agitator to a pre-arranged level, which measures a charge of about 1100 gallons; and after allowing it to settle, any water which may be present is drawn off through the waste cock. The agitation commences, and sulphuric acid of 168° Twaddel is then added in quantity determined by the character of the crude benzol. The agitation is carried on for a period of from thirty to sixty minutes. The tar acid is then allowed to settle, and afterwards run off. This acid-washing is done a second time; the benzol being afterwards washed with water to remove the acid as completely as possible.

A weak solution of caustic soda (about 20° Twaddel) is then added in sufficient quantity to completely neutralize any traces of acid remaining; and, after agitation and settlement, the waste soda liquor is run off. The washed benzol is then pumped out, and passes by the pipe D to the still E. This still usually consists of a mild-steel cylindrical closed vessel, and is fitted externally with (1) a suitable manhole, (2) various mountings for inlet and outlet connections, (3) safety valve and pressure gauge, and internally with a closed wrought-iron coil for dry-steam heating, and a perforated pipe for blowing steam in the liquid. The still is supported on a brickwork structure or cast-iron saddles, and is covered externally with some form of non-conducting material.

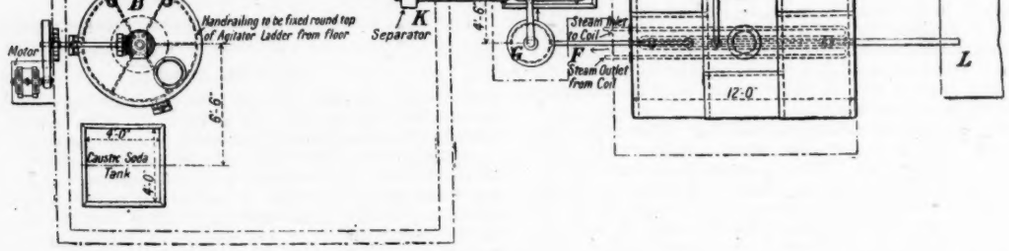
The charge of benzol from the agitator is now heated in the still by means of the closed dry-steam coil; and the vapours disengaged pass from the still by means of the pipe F to the fractionating column G. This column consists of a series of capped trays, in which the ascending vapour is made to bubble through the descending liquids, which condense from the vapours in their passage up the column—thus ensuring the lighter portions only leaving the column head. The heavier portions are returned to the still by means of the pipe H. The vapours leaving the column head pass into the condensing coil J, where they are cooled to the liquid form, and pass thence to the separator K, where any water present is removed.

As the distillation proceeds, and the lighter products have been driven off, it will be found necessary to admit steam through the perforated pipe, in order to carry over the liquids of higher boiling points. This continues until eventually on testing a sample from the separator, it is found that the whole of the products which it is desired to collect in the liquid form have been removed. The distillation is then stopped; and the residue remaining in the still is run off into a settling tank L. Here it is allowed to cool, and the solid naphthalene settles out—the heavier oils in the mass being pumped back into the debenzolized oil-storage tank, and the naphthalene removed to store. The still is afterwards recharged with washed benzol, and the operation goes on as before.

From the separator the liquid is collected in 50-gallon drums



Front Elevation.


From Crude Spirit Tank
2" Dia. W.I. Pipes
From Agitator to Still
Pump Foundations
5½" × 4¾" × 5" Pumps with 3" Suction & 2" Delivery
Catch Tank
Funnel
Coil 2" Dia. in Water Tank
Handrailing to be fixed round top of Agitator Ladder from floor
Separator
Steam Inlet to Coil
Steam Outlet from Coil
Motor
4'-0" Caustic Soda Tank
12'-0"

Plan.

FIGS. 3 and 4.—MITCHELL'S IMPROVED STILL AND SEPARATOR FOR REFINING BENZOL AND TOLUOL.

and a sample from each drum is tested in the laboratory. The contents of the various drums are afterwards mixed, so that the final product complies with one or other of the tests previously given.

To ensure the maximum efficiency in the working of crude and rectified benzol plants, certain tests (which although they are simple) should be made; and it is desirable they should be made systematically. While we are fully alive to the fact that these tests only give comparative results, and not strictly scientific results, it will be found that, for comparative purposes, they give results which are quite as informative as those obtained by strictly scientific methods, and involve an expenditure of only a fraction of the time and labour.

In order to ensure efficient working of the oil-scrubbing arrangements, it is desirable that the gas should be tested for benzol content on entering and leaving the scrubbers. Ten cubic feet of gas should be passed through a series of wash-bottles containing in all 400 c.c. of creosote oil, on which a blank-test has already been made. The contents of these bottles should be transferred to a suitable glass retort, and heated until 50 c.c. have distilled over. After the separation of the water, this distillate is transferred to a round-bottomed flask fitted with a suitable fractionating column and condenser, and the temperature raised till the thermometer in the head indicates 120° C., when the distillation is stopped. The liquid condensed is collected, carefully measured, and the result of the blank-test of the oil deducted from it. From this—which may be expressed as the crude benzol content of 10 cubic feet of gas—the amount per ton of coal can be easily calculated. It is obvious that the result of the above test on the scrubbed gas should be as low as possible.

To ensure that the still is properly stripping the oil of its benzol content, tests should be made on the benzolized and the debenzolized oil. For these purposes, 400 c.c. of each of the above are taken and subjected to exactly the same test as the oil from the wash-bottles in the previous case.

The amount of condensed liquid obtained in the final distillation divided by 4 (since 400 c.c. were taken), gives the percentage saturation in the case of the benzolized oil, and in the case of the debenzolized oil, a measure of the extent of stripping by the still.

We have endeavoured within the limits of this short paper to review as completely as possible the present practice in the extraction and rectification of benzol in gas and coke works; and in the discussion which we feel assured the "crude" nature of the paper will provoke, knowledge will, by a "process of extraction" be obtained from the members, which will no doubt "rectify" our mistakes, and which we are prepared to "absorb" to any "degree of saturation;" and if this is so, the "final product" will be a "lighter spirit."

DISCUSSION.

The PRESIDENT said they would all be agreed that the subject before them was a live one—a red-hot one; one in which they were all keenly interested; and one of the greatest importance at the present juncture. The paper was one founded on actual experience, although the laboratory experimental side of it was not in any way small. The authors' modest disclaimer was not to be taken too seriously. One thing which had struck him in the paper was that the financial considerations in the matter had been—and rightly, in his view—excluded. It spoke volumes for the enterprise of the Wombwell authorities and their Engineer and Bye-Product Manager that a gas-works of such a size should have gone so thoroughly into this question. Before calling upon any gentleman to open the discussion, he would like to ask the Secretary to read a letter from Mr. H. Townsend, of the Wakefield Gas Company, who was unable to be present.

The HON. SECRETARY read Mr. Townsend's letter, in which (after expressing his regret that he could not attend) he said he had already had an inspection of the Wombwell plant, and had gained much valuable information from a chat with Mr. Walmsley, which would be of great help in the erection of a plant at his own works. He had read with regret, in a notice of the forthcoming meeting and visit, the following paragraph: "This plant is now in operation, and is achieving gratifying results with surprisingly slight deterioration of the normal supply of gas to the district." This "surprisingly slight deterioration," wrote Mr. Townsend, was doubtless due to climatic considerations; and a different state of affairs would take place when the keen frosts of winter came. Then the illuminating power would undoubtedly suffer severely. If not, what need was there for the Gas (Standard of Calorific Power) Act, 1916? Nearly every gas company which was patriotically putting in oil-washing plant, and consequently applying for the adoption of the Act, was being baited by the local authorities concerned; and he sincerely trusted the discussion of the question at the meeting of the Institution would not give these authorities, by means of an *ex parte* statement, an additional weapon with which to fight gas companies.

The PRESIDENT said he was glad of this letter. It was in the spirit in which these matters should be approached—the spirit of rational criticism.

Mr. THOMAS GLOVER (Norwich) said he had greatly enjoyed the day's proceedings. Like other members, he had come to pick up information, though he had now had considerable experience in oil-washing and the extraction of crude benzol. He dared say, therefore, the meeting might be glad of any remarks he would be able to make on the subject. With regard to illuminating power, at first there was a very decided reduction; and it was almost hopeless now to expect to light premises with flat-flame burners. The question of the luminosity of flat-flames should just be boldly faced, and incandescent burners introduced more commonly to take their place. The stripped gas was particularly well suited for incandescent burners. Also, it was his own opinion that the 500 B.Th.U. standard was a suitable one where oil-washing was introduced; and, if the gas was not degraded in other ways, they would have no difficulty in keeping to the standard. With regard to the method of washing, in his own case they used a tar-scrubber; but they introduced the oil in two stages. To get a higher saturation, they introduced the debenzolized oil at the top; and at a lower stage they recirculated benzolized oil. The effect was that in a simple scrubber they got a 4 per cent. saturation, which was regarded as very good according to what he could gather. He understood many works were only getting 3 per cent. This meant that they had less oil to treat in the stills the higher the saturation was, and the less heat was required. He understood that some plants were absorbing a great quantity of steam in distillation. Mr. Walmsley, in his paper, had bravely faced the situation and given figures. In his reference to the steam-heated still in operation at the Mitchell Main Colliery, he had stated that in a recent test on plant dealing with wash-oil from 200 tons of coal per day, with steam at 70 lbs. pressure, the steam consumption was at the rate of 66 lbs. per 100 gallons of oil treated. This was a useful figure for comparison. Mr. Walmsley also said somewhere in the paper that the pressure of the steam was an important matter, and that pressures down to 40 lbs. per square inch might be employed. This was a useful statement. Personally, he had had many inquiries on the matter, and had been rather afraid to use so low a pressure as that. He used 100 lbs. pressure, which was only reduced just as it entered the still. There was nothing in the paper, so far as he remembered, about the quantity of oil to be used per ton of coal. In the tar process which was proposed for the increase in the absorption of toluol, only 10 to 11 gallons of tar were available per ton. It must be so, because this was what was made. But when they were using oil, they were not limited to 10 gallons by any means. It was advisable to use up to 60 gallons. At this juncture it was pointed out to Mr. Glover that the matter was referred to in the paper in the first paragraph under the heading "Quantity of Extracting Medium, &c."] Mr. Glover, proceeding, said there was another point mentioned in the paper—that trouble was being experienced (he himself had experienced it, and he knew of others also), and very considerable inconvenience caused, if they did not prevent emulsion of water with the oil. This could be done by having a well-designed plant, worked according to the instructions of experienced people. It had been one of the experiences in the evolution of oil-washing that had had to be gone through; and he supposed that beginners would have to go through it to some extent. The emulsion was helped in two or three ways. First, in the washing process, the oil should be at a little higher temperature than the entering gas. If the gas were at 60° Fahr., the oil should be at 65°. Then the preheaters which heated the oil entering the still should be efficient enough to give a temperature well above that of boiling water. The oil should be 110° or 112°, or 115° if they could get it at that; and the oil leaving the foot of the still should not be under 100°. If this was done there was no trouble in getting the 2 or 3 gallons of crude benzol—that was, benzol which was called 60 per cent. or 65 per cent.—at 120° per ton. As to the financial side of the matter, it was all so much to the good. They got from the gas a spirit worth so much per gallon; but apart from being a paying proposition, it must be very clear that it was their patriotic duty to extract what the Government required for the manufacture of explosives. The only other point on which he would like to dwell was the question of naphthalene. In the washing oil, they extracted a great deal of naphthalene; but there was sufficient left in the gas, if it were not accompanied by naphthas, to give trouble. The only thing to do was to substitute other vapours to compensate for those extracted; and the most definite way was to vaporize petroleum oil, which would bring the naphthalene out with it, and prevent it forming into solid bodies.

Mr. ROBERT WATSON (Doncaster) said there was no doubt about it that they all had to do their best to get as much benzol as possible. Nevertheless, however simple the apparatus might appear, there were difficulties in oil-washing which they would undoubtedly have to face. It had occurred to him that these difficulties, being principally in the deposition of the naphthalene—he did know there was a good deal of inconvenience through this in the country—the means of obviating the trouble did need some investigation. It would be an exceedingly good thing if those of them who had been successful in surmounting these difficulties and those who had so far failed, would meet together and state their views, and he thought some of the problems would be solved. They had, in his own case, a benzol plant somewhat similar to that at Wombwell; and his experience was that, while he had naphthalene troubles since the adoption of the tar-washing process, these troubles had been greatly increased latterly. Whether this was due to climatic conditions or other causes, he had been troubled very considerably with an increased number of naphthalene difficulties. He thought, from what he had noticed that day, that he had begun to see some little daylight. They had been told that by the use of paraffin spraying they should ultimately keep down the naphthalene. He did not know, however, but what, where paraffin was used, they still had naphthalene trouble. Undoubtedly creosote oil did take out a lot of naphthalane; but there was sufficient left to give trouble. His own efforts at paraffin-spraying had so far given a unit of naphthalene within about a mile or so of the works. He did not raise this question of naphthalene difficulties with any intention of frightening anybody who had not yet adopted oil-washing. The experience of Mr. Walmsley and Mr. Glover was sufficient to show that the difficulty could be got over, and that, by a continuance of the oil-washing, they could become practically free of it. With regard to the question of luminosity and candle power, he did not think they need be much afraid of stripping the gas, because with the new burners Messrs. Bray and Co. had introduced they could get a flame with washed gas which was practically as good as with ordinary burners using ordinary 15 or 16 candle gas. So far as calorific power was concerned, it might be of interest to members to bear in mind that they did not notice any difference in using incandescent burners. At a test made by his own concern the previous week, at a local brass-foundry, in melting brass in a 150-lb. crucible, the result had been sufficient to indicate that the gas for heating power was not appreciably affected.

Mr. H. KENDRICK (Stretford), following up one or two remarks by Mr. Watson in regard to naphthalene, said he thought the amount of petroleum that was required varied at different works. The figure mentioned somewhere (18 to 20 gallons per million) was absolutely useless so far as his place was concerned. They used more than double—some 36 to 40 gallons. With this quantity, partly vaporized and partly atomized, they were keeping their naphthalene trouble well in hand. To-day they found that the oil in the form of mist penetrated right through the mains to as far as five miles away; and practically all the troubles they had had during the past six months had simply been in some side streets, where the gas had had time to settle. With regard to luminosity, he was not of the same opinion as Mr. Townsend; and he thought the question ought to be ventilated and discussed in order to educate some of their friends who would have to deal with the question. One statement he had made to the Board of Trade with reference to his undertaking's application for a change of standard, was that in their experience with the lower candle power the gas they were now sending out gave, in their opinion, a light of actually higher value than under the old quality gas, in incandescent burners. He had also pointed out to the Board that with burners of the description which had been mentioned, a higher illumination could be obtained.

Mr. SAMUEL GLOVER (St. Helens) said in regard to the point about fixing the position of the washer, it was very important to have it after the ammonia extractors. The authors asserted that so much ammonia was lost to the gas department in the process. He thought this point ought to be further cleared up. He thought, also, the authors were rather vague about the difficulties of washing oil. The naphthalene trouble, especially after the first delivery of so-called wash-oil, which might be quite unsuitable for the purpose, might be serious. The description of the wash-oil in the paper was rather too weak, as the creosote oil obtained in the distillation of coal tar was just the grade of oil which was loaded with naphthalene, and would be supplied so loaded if a close watch were not kept. He would suggest that the order in which these wash-oils were used should be changed, and more emphasis be given to the position occupied by anthracene oil. Anthracene oil was absolutely suitable for the purpose, and avoided some of the difficulties brought about by creosote oil. Oil for this purpose, also, should be supplied dry.

Mr. W. WHATMOUGH (Heywood) said there was one point in reference to illuminating power which he would like to mention. So long as the extraction of benzol was a national need, it ought not to be left to voluntary effort on the part of gas authorities. If it was of such great importance as was understood, why did not the Government say outright that it must be done, and so save the trouble of companies and local authorities having to apply and being opposed, and having to fight expensive battles. If it was necessary, it ought to be made compulsory.

Mr. E. H. HUDSON (Normanton), speaking in regard to the placing of the apparatus for dealing with wash-oil after the ammonia had been taken from the gas, mentioned that early in the paper the penalty was said to be that they lost ammonia in the gas. Was there not a greater penalty? Would not the ammonia left in the gas after washing, if taken up by the oil, have a deleterious effect on the pipes in the debenzolizing plant?

Mr. J. E. MITCHELL (Mitchell Main Collieries, and Chairman of the Wombwell Gas Committee) asked, in regard to the difficulties mentioned by various speakers, was it not possible that the stripped gas was not so much the offender as old trouble in the mains which was stirred-up by the stripped gas passing through and picking up the naphthalene in the pipes. A small test as to naphthalene content of the stripped gas would soon prove it one way or the other. They had had little of such troubles in Wombwell.

Mr. WALMSLEY, in reply to the discussion, referring to Mr. Glover's remarks on steam pressure, said at Wombwell they used down to 40 lbs., and found it suitable. As remarked in the paper,

the higher the pressure (within limits) so much the better; but the point which struck the authors was that, in contemplating the installation of a benzo' plant, the question of boiler power on a small works might enter into the matter, and what they meant to show was that a low pressure need not act as a deterrent. As to the quantity of oil per ton of coal, this was stated in the paper, as had been pointed out. In regard to the question of working costs, these had been purposely omitted, because the authors did not think it ought at present to be looked at from that point of view at all, as to whether by putting down a shilling to-day the concern would get eighteen pence to-morrow. It was a matter of national duty; but, at the same time, they might take it from him it was a paying proposition. In regard to Mr. Watson's remarks on naphthalene troubles, he (Mr. Walmsley) had mentioned earlier in the day that possibly the explanation might be the one offered by Mr. Mitchell—that the debenzolized gas was taking up the naphthalene already in the mains, and carrying it forward. Before they started oil-washing at Wombwell, they had various troubles at different seasons of the year—as many as fifty or sixty complaints per day. At present they averaged about two or perhaps three per day. In regard to the effect on the gas, as they were aware, it was easy to see that, so far as illuminating power was concerned, there was certainly a serious depletion in the case of flat-flame burners; but in the case of incandescent burners, he agreed with Mr. Kendrick that for incandescent lighting the gas was more suitable than before. It was, as Mr. Kendrick had said, just a question of flame temperature. It was conceivable that they could have two gases of the same calorific value, but of quite different flame temperature.

Mr. MORFEY said, as regarded the quantity of oil per ton, this was entirely a measure as to the saturation they obtained and the amount of benzol they got per ton. In regard to ammonia lost in the separator in distillation, it was not entirely lost, as Mr. Glover had rightly said, because it was partly recovered in the water as it came back. As regarded the creosote oil, if they got the creosote oil which only contained 5 to 10 per cent. of naphthalene, they were doing very well. He quite agreed that anthracene oil was good for scrubbing; but the supply of it was extremely limited. In reference to the presence of water in creosote, there was a tendency to find more water in anthracene oil than in creosote. Naphthalene trouble was chiefly due to its being picked up in the mains and deposited in the cooler portions of the services.

VOTES OF THANKS.

The PRESIDENT proposed a hearty vote of thanks to the Chairman of the District Council (Mr. Allott), to the Directors of the Mitchell Main Colliery Company and Mr. Mitchell, and to Messrs. Walmsley and Morfey. They had, he said, had that day an intellectual treat added to most generous hospitality. Many of them had discovered Wombwell for the first time; but they would remember it all their days. The only mystery was that they had not discovered it before.

Mr. WHATMOUGH seconded the motion, which was carried with acclamation.

THE OFFICE-BEARERS FOR 1917.

The election of officers for the ensuing year resulted as follows:

President.—Mr. W. Whatmough (Heywood).
Vice-Presidents.—Messrs. J. P. Leather (Burnley) and E. H. Hudson (Normanton).
Hon. Treasurer.—Mr. James Braddock (Radcliffe).
Hon. Secretary.—Mr. G. S. Frith (Runcorn).
Committee.—Messrs. J. T. Broughton (Congleton), H. Davies (Brighouse), and P. D. Walmsley (Wombwell).
Auditors.—Messrs. Charles Potts (Hyde) and William Hill (Stalybridge).

"Fletcher" Gas-Fires.

Introducing their gas-fire list for the present season, Messrs. Fletcher, Russell, and Co., Limited, of Warrington, remark that they have thought it advisable, owing to the national crisis, not to introduce any new designs this season, but, instead, to devote the whole of their energies to perfecting the design, appearance, and heating capabilities of the existing patterns. The principal improvements made are three in number. In the first place, there is the jet, which, by a simple arrangement, is said to give perfect control and absolutely accurate adjustment for all pressures and calorific values. It is silent; and with it the gas is delivered at full main pressure into the burner, which the firm remark is an ideal and common-sense condition ensuring real efficiency. The burner, too, has been altered in construction, so that in cases where the gas is both of low pressure and poor calorific value, the heating power and appearance of the fire are in no way impaired. It may easily be adjusted and regulated to give equal results to one supplied under the most favourable conditions of richness and pressure. The firm still fit to fires their patent non-lighting-back arrangement, permitting turning down to any extent without risk of the burner lighting at the jet. Thirdly, there is a new pattern fuel, which has been designed on scientific lines to give the best possible radiating effect combined with a pleasing appearance. While there are no actual obstructions in this fuel to break-up or shorten the flame, they point out that at the same time there is no actually clear passage for the heat to be wasted through—the hottest zone throughout the flame being made to give its best heating effect from the lowest part to the top of the fuel.

MUNICIPAL PROFIT-SHARING SCHEMES.

[Two Papers read before the Midland Association of Gas Engineers and Managers, Oct. 26.]

By R. S. RAMSDEN, of Burton-on-Trent.

Having a firm faith in discipline, and holding that the reasonable requests of the master of any society which I have joined of my own free will should be considered and obeyed as commands, I will do my best to comply with our President's request for a short communication on the profit-sharing system in operation at Burton-upon-Trent.

Mr. J. Ferguson Bell, our Consulting Engineer, having inaugurated a most successful profit-sharing scheme while he was at Stafford, we naturally had many quiet talks about introducing the system at Burton-upon-Trent; and when, three years ago, we were faced with an all-round application for advances in wages, the time seemed opportune for dealing with both matters at one operation.

Mr. Bell submitted an exhaustive report to the Gas Committee, pointing out the weakness of a profit-sharing scheme compared with co-partnership, which, unfortunately, corporations cannot adopt; and I cannot do better than quote a few paragraphs from Mr. Bell's report, dealing with the point, and with which I agree.

> The weakness of the scheme as introduced at Stafford, as compared with the South Metropolitan Company's and other companies' profit-sharing, is that the latter not only induces employees of the company to take a real interest in their work by giving them a new motive for endeavouring to promote the prosperity of the company, but, what is of equal importance, it gives them an opportunity to improve their position in life by saving their annual bonus and becoming shareholders in the company.
>
> The payment in money is, to my mind, a mistake, and often leads to reckless extravagance; the bonus being sometimes spent in questionable indulgences.
>
> The late Sir George Livesey, along with myself, felt that payment in money once a year was undesirable; but we were unable to suggest any other method.
>
> After careful consideration of the whole subject, I think the most satisfactory principle is to take as the basis the cost of gas, including coals less residuals, and all other charges, less the amount given in aid of rates, or special grants for specific purposes outside the gas and electricity undertakings.

The Gas Committee approved of the principle, and a scheme was drafted which, had it been in operation for the three preceeding years, would have represented bonuses of 4½ and 5½ per cent. respectively.

Mr. Bell and I met a deputation from the workmen with their Organizing Secretary and explained the scheme to them. As it was accompanied by an offer of increased wages, and there were no restrictions as to what a man should do with his bonus, it was accepted. Some months afterwards the following statement was issued to each employee of the Gas Department, explaining how the bonus would be calculated, and urging all in their own interests to do their utmost to keep down working costs during the trying times we were going through after the outbreak of war.

Burton-upon-Trent Corporation Gas Department.

PROFIT SHARING.

The following notes are written in response to a request for a little more information about the profit-sharing system inaugurated by the Gas and Electricity Committee as from the beginning of April, 1914.

The object of the scheme is to give all the employees of the Gas Department an inducement beyond their salaries or wages to take greater interest in their work and in the welfare of the gas undertaking. The principles on which the scheme is based are as below:

1.—That when the total net expenditure for manufacturing (less the receipts from residuals), distribution, and all other charges, exclusive of interest and repayment of loans, shall be, in any year, less than 2s. per 1000 cubic feet of gas sold, then the employees of the Gas Department shall be entitled to a bonus on the salaries, wages, sick pay, or accident pay received by them, calculated at the rate of ½ per cent. for every penny or fraction of a penny below the said 2s.

2.—That the distribution of bonus shall be *pro ratâ* on the sums actually received by the employees during the year, and shall be paid after the annual accounts (which are made up to March 31 in each year) have been adopted by the Gas Committee.

3.—That no bonus shall be divided among the employees who shall have been employed in the department for less than three months during the year in which the bonus has been earned.

4.—The Committee shall have power to withhold the bonus from any employee who, in their opinion, is not deserving of the same, owing to inefficient work, indolence, or misconduct.

An example will explain the first principle.

For the year ended March 31, 1913, the total working expenses were	£43,423
And the receipts from residuals, fittings, and sundries were	21,260
Leaving the net working expenses	£22,163
The quantity of gas sold in millions of cubic feet was	383½
Showing the net cost per 1000 cubic feet to be	13·87d.
The basis price referred to in the first principle is	24·00d.
And the difference is	10·13d.
Consequently the bonus would have been	5½ per cent.

The wages and salaries for the year amounted to, roughly, £10,000; and 5½ per cent. on this would have been £550.

Taking the case of a man whose wages average 25s. a week, or £65 for the year, 5½ per cent. represents £3 11s. 6d.

It is up to every man and youth in the employ of the Gas Department, in his own interest, therefore, to strive his utmost to work the gas undertaking more economically and efficiently.

Each employee should have a good idea how to employ his time and materials which he uses to the best advantage; and when he sees from the example quoted that salaries and wages—in other words, expenditure on time—amount to about half of the net working expenses, he will realize that time is the most valuable commodity with which the gas undertaking has to do.

Any further information on the subject will be given as far as possible on application to the undersigned; and if the men in any branch of the Gas Department care to meet periodically to discuss the more efficient working of their own particular work, reasonable facilities will be given.

January, 1915. R. S. RAMSDEN, Manager.

The effect of the scheme is that when the net cost of gas is 1s. and under 1s. 1d. per 1000 cubic feet, the bonus on all salaries and wages is 6 per cent.; 1s. 1d. and under 1s. 2d., 5½ per cent.; 1s. 2d. and under 1s. 3d. 5 per cent.; 1s. 3d. and under 1s. 4d., 4½ per cent.; 1s. 4d. and under 1s. 5d., 4 per cent.; 1s. 5d. and under 1s. 6d. 3½ per cent.; 1s. 6d. and under 1s. 7d., 3 per cent.; 1s. 7d. and under 1s. 8d., 2½ per cent.; and so on up to 2s.

Owing to the adverse conditions under which we were working during the winter of 1914-15, the net cost of gas for the year ended March 31, 1915, worked out at 1s. 7·91d. per 1000 cubic feet sold, compared with an average of 1s. 3·12d. for the four preceding years; and the profit-sharing bonus was only 2½ per cent. This was a disappointment to the men; but I think it made some of them more careful during the following year.

Before the close of the year ended March 31, 1916, the Gas maintenance of public lamps, which is charged to the rates, in Committee's sanction was obtained to deducting the cost of the arriving at the net cost of gas, and to bringing forward the cost for the preceding year as a credit entry. We were working under more favourable conditions during 1915-16, and the net cost of gas for the year was 1s. 3·4d. per 1000 cubic feet sold, entitling the employees of the department to a bonus of 4½ per cent., which was receeived with, I believe, general satisfaction.

Every employee of the Gas Department (from manager to office boy) participates in the benefits of the profit-sharing scheme, together with the prepayment meter collectors, although the latter are under the control of the Finance Committee of the Town Council. The question of allowing those clerks in the Borough Treasurer's Department whose time is principally occupied with the affairs of the Gas Department to participate in the bonus was considered; but the matter was dropped, owing to the difficulty in drawing the line of demarcation.

From our short experience of profit-sharing at Burton-upon-Trent, I believe it to be a step in the right direction towards lower working costs and, what is of more real importance, improving the position and outlook on life of the working man. Although all of them do not do so, some of the men do honestly take an interest in the welfare of the gas undertaking; and it is an encouragement to such men to know that their efforts will be of direct benefit to themselves and their families.

A more useful paper on this subject could no doubt have been prepared by those of our members who have had longer experience of profit-sharing systems; but it has been a pleasure to me to prepare this short memorandum, which I hope may prove of some use by eliciting information and expressions of opinion from the members generally. To those who are contemplating the adoption of profit-sharing, I would commend a perusal of Mr. Pooley's presidential address to this Association in February, 1907, and the late Sir George Livesey's paper on "Co-Partnership" read before the Southern District Association in November, 1907. The Labour Co-Partnership Association, in Bloomsbury Square, London, would no doubt be pleased to render assistance in starting a scheme.

By W. M. VALON, of Stafford.

I have pleasure in acceding to the request of the President for full particulars of the Stafford profit-sharing scheme, which is as follows:

The scheme has been in operation since 1900 (that, is seventeen years), and the amount distributed yearly among the employees has been:

		Per Cent. on Wages.
1900	£185	equal to 4½
1901	59	,, 1·1
1902	*Nil*	,, —
1903	183	,, 3½
1904	298	,, 5
1905	387	,, 7
1906	448	,, 7½
1907	436	,, 7½
1908	518	,, 9
1909	368	,, 6·3
1910	548	,, 9½
1911	644	,, 10·55
1912	743	,, 11·2
1913	802	,, 10
1914	975	,, 10·344
1915	988	,, 10 98
1916	1066	,, 11·679

The basis for calculating the amount of money to be shared among the employees is:

1.—That when the total cost of manufacture and distribution of gas shall be less than 11d. per 1000 cubic feet of gas sold, a bonus equal to one-fourth of the difference between this sum and the actual cost shall be divided among the workmen and staff who have been employed in the Gas Department for not less than three months during the year in which the bonus has been earned.

2.—That in any year where special charges (such as main-laying operations) have been charged against revenue, instead of debiting the same to capital account, the amount of such (correctly speaking) capital charges be deducted from the true manufacturing and distributing charges, in addition to the net cost of coal, rates and taxes, depreciation, and depreciation on cookers, &c.; and that effect be also given to the profit of gas-fittings.

The details of the bonus for 1916 are:

	Pence per 1000 Cubic Feet Sold.
Total working expenses	11·848
Less rates and taxes and district fund proportion of salaries	1·808
	10·040
Less profit on fittings	0·256
	9·784
Less capital charges charged to revenue account	2·883
	6·901

The bonus was, therefore, one-fourth of the difference between 6·901d. and 11d., or 4·099d., which equals 1·025d. per 1000 cubic feet sold. This amounted to £1066; and the bonus was equal to 11·679 per cent. on the wages paid.

You may desire to know how the basis figure of 11d. was originally arrived at; but although I have gone through all the old Committee report-books, &c., I cannot get exactly at it. But it appears to be a figure that the Committee, at the time the bonus was first inaugurated, considered that gas should be made at (*ex* the cost of coal), for the rates then being paid, and that any saving on this figure the workmen were entitled to receive a portion of.

You will, no doubt, notice that, by the method of computing the bonus at Stafford, if the workmen are conceded a rise of wages, which automatically increases the cost of manufacture, unless some arrangement was made the rise of wages would have the effect of decreasing the men's bonus at the end of the year, and would be really what is commonly called an "Irishman's rise."

The bonus scheme was not put into operation at Stafford with any idea of having the rate of wages paid to the men below the corresponding rates for the district; and I may say that the rates paid are equal to those of any works of corresponding size.

In the event of a rise being given to the men, a correct record of what it actually amounts to each week is kept for twelve months; and should it be found at the end of the year that the rise has increased the cost of manufacture by (say) ½d. per 1000 cubic feet, then this amount is added to the basis figure. This will be, perhaps, more fully explained when I say that the original basis figure at Stafford was 10d. per 1000 cubic feet; but due to rises being given equal to 1d. per 1000 cubic feet, the original figure has been increased to 11d., as already explained.

One point to which I would particularly call your attention with reference to the Stafford scheme, and contrary to most, is that the profit made on the year's trading does not affect the bonus; and this personally I consider an important point, because in schemes where the year's profits are taken into consideration, the workmen may this year be paid, owing to a high profit, (say) 12 per cent. on their wages, and the proprietors of the undertaking, feeling that they can decrease the cost to the consumer, take off (say) 3d. per 1000 cubic feet from the price, with the consequence that next year the profits are decreased, and also the amount of bonus paid to the men. Personally, I am strongly of the opinion that, where possible, all bonus schemes should be worked entirely on the wages cost of manufacture, irrespective of any profit made.

Originally our bonus was paid once a year in the form of a lump sum payment; but shortly after the present war commenced, we unfortunately found that men were losing a lot of time, and it was therefore decided that, although the men's wages had been raised so as to help towards the extra cost of living, a certain proportion of the bonus should be paid weekly as an incentive to good time-keeping. It was decided that at the end of each week a bonus of 10 per cent. should be paid to all men who during the week had not lost any time, and, *vice versâ*, if a man lost time he should receive no bonus for that week. I may say that this has had a most excellent effect. Under the existing rule, when the bonus is made out at the end of the year any difference between the 10 per cent. paid and the actual amount earned is adjusted thus: In the event of it being more, the difference is paid to the men in a lump sum; whereas should it be less, the bonus for the following year will be paid on the figures for the current year, which, of course, means that if the current year only works out at 8 per cent., whereas the men have already received 10 per cent., then next year their weekly bonus will only be 8 per cent., and any difference, of course, will be again adjusted at the end of the year.

DISCUSSION.

Mr. VALON, introducing his notes, said that as the Stafford scheme had been in operation for seventeen years, they could claim to have had a fairly good experience of its effect. The table showed that for the first year [1900] 4½ per cent. was paid on

wages, for the second year 1·1 per cent., and for the third year there was nothing. The reason he mentioned this was that the scheme was then altered. It was first of all based upon profits; and it was afterwards put on the basis of working costs, which was the only fair way. The table showed that since 1903 the percentage divided had gone on increasing, though the wages had increased with it. He would like to say there was no doubt whatever, so far as the undertaking he was connected with was concerned, that the scheme had been most valuable. For many years they had not had an unpleasant dispute with their men. This did not mean that the wages had not been increased; they had been considerably. But he had always found that the men came in a reasonable spirit, and were quite prepared to consider the matter properly. They had increased the wages of labourers 5s. since the war commenced; and these men now went home with over 30s. in their pockets. There was no doubt that if those who had trouble with their men could only get hold of some bonus scheme, they would find it one of the most satisfactory things going.

Mr. J. Ferguson Bell (Derby) remarked that the question dealt with was of very special interest to him; and he wished to congratulate Mr. Ramsden and Mr. Valon on their working of the systems detailed. It was some seventeen years ago that he (the speaker) introduced the plan of what was then profit sharing at Stafford. At that time, he believed, the Council regarded it as one of his freaks, and thought that when he left Stafford it would come to an end. Mr. Pooley and Mr. Valon had been at Stafford since then, and the system still continued. This was something to go upon. He was exceedingly glad to hear Mr. Valon's emphatic statement as to the absence of trouble with the workmen. Mr. Valon had altered the scheme since he (Mr. Bell) was at Stafford; and he ventured to think that it had been altered for the worse. It was then based on a sharing of profits, whereas now it was really a bonus on wages; and, of course, a bonus on wages and profit-sharing were two different things. He first had the matter of profit-sharing or co-partnership brought to his notice by the late Sir George Livesey, who was a prince among men. About 26 years ago, there was a big strike at the South Metropolitan Gas-Works, in which the men were beaten; but Sir George found that it had cost him £100,000 to beat them, and with a desire to prevent disputes he evolved the co-partnership system. They all knew how splendid had been the results, and that the principle had also spread to many other companies. His own experience with the scheme at Stafford was, of course, very limited; but during the year or two he remained there after its introduction, he found it was an incentive to the men to perform their work honestly and well. What they required to do to-day was to try and unite capital and labour; and therefore the time was exceedingly appropriate for such contributions as they now had before them. He knew of no other system whereby they could induce men to take an interest in their work. Too often they found a workman had a certain amount of suspicion of his employer. What was required was to induce a man to give a fair day's work for a fair day's pay. They wanted him to see, not how little he could do, but how much. A man should be fully employed and take a reasonable interest in his work; and the plan of giving him a share of the profits was the means of attaining this end. Recently before the Institution of Civil Engineers Mr. Harold Cox, M.A., delivered an address on "Industrial Development" which he suggested members of the Association should peruse. There it was pointed out how important it was that they should take some means of trying to satisfy labour. The author pointed out that one result of the war was that there was an abounding prosperity in respect of labour. The labouring people had become used to certain comforts—there had been a rise in the standard all round; and the question was whether after the war things were likely to go back to the old conditions. The author was rather inclined to think not. Of course, if they could give a worker a higher rate of wages, and induce him to give greater value in return, they would be only too pleased to do it. The address went on to point out that men of all ranks were standing shoulder to shoulder fighting the enemy and facing death. It was a pleasing fact that the working classes had so nobly responded to the country's call; and he did hope that when these men came back it would not be to enter upon another war between capital and labour. They should all seriously consider whether they could not do something towards solving the most important economic problem of the day—the uniting of capital and labour. Giving a man an interest in his work over and above his wages would, to his mind, be the best means of doing it. Those companies who had introduced profit-sharing and co-partnership had prospered. It might not be applicable to all businesses; but the gas industry was one of those that could well take it up. Mr. Valon remarked that the difficulty was, if profits went down, the bonus would go down. This was inevitable in every profit-sharing scheme. This was what was wanted. If their dividends increased, Parliament had already, through the sliding-scale, made the consumers co-partners with the shareholders; and if they could bring in the third co-partnership in the shape of labour, they would have a combination which would certainly tend to prosperity. The bonus scheme seemed to have drawbacks. For instance, he thought that they were introducing vertical retorts at Stafford, which would perhaps decrease cost of manufacture. What action would Mr. Valon take in connection with the bonus? Would it go up further? It was now about 12 per cent. The arrangement should be such that the employee would go up and down with the capitalist. Of course, it was unfortunate that corporations could not take the money and hold it for the men, because he was strongly of opinion that the payment each year of the bonus in cash did not tend to that success of the system which would be secured if they could make them partners. At Stafford, he found that, with a good number of the men, when they got the bonus, it "burned a hole in their pockets," and in some cases he was afraid it did them more harm than good. If they could make them shareholders, and so give them a direct interest, it would be much better. But he had talked the matter over with Sir George Livesey; and they could devise no means whereby they could make the men co-partners. He did not now see any way at all of doing so. The whole subject was, however, well worth consideration by members—especially at the present time. There was a great amount of unrest now; and this might be accentuated later on. Therefore anything they could do to induce their men to be loyal, and to take an intelligent interest in their work, would be of value. Their aim should be to raise the standard of the employee—making him a better man, a better worker, and a better citizen. If they could do this, their reward would be given to them in the results obtained.

Mr. C. H. Carder (Oldbury) said there had been two methods referred to, both of which were open to certain objections. One was a method of bonus on wages, based on working costs, and the other a division of surplus profits. He had had the privilege and financial benefit for some years of participating in a third method which he thought surpassed both. It was based on the selling price of gas. In the first case, if the bonus was based on working costs, there was a temptation to cut things down to the lowest figure, which made for trouble; while, on the other hand, if there was a scheme whereby only surplus profits were divided, it was an inducement to sell gas at as high a price as possible, which was not good policy. With a scheme whereby for each 1d. reduction below a certain figure (generally fixed higher than the price at which the undertaking was then selling) in the price of gas, the bonus was increased, not only was the workman financially benefited, but so was the consumer.

The President (Mr. C. H. Webb, of Stourbridge), said the reason there had not been more discussion was no doubt due to the fact that members generally had not had experience of the system. When he asked the authors to give these papers, it was primarily because he was seeking information for himself, though he felt sure that other members also would find the subject most interesting. The profit-sharing system was fully developed in the case of companies; and he did not see why it should not be in the case of corporations, though, of course, it was a great disadvantage that they could not give the men what the companies could—that their distribution must be in the form of cash. If it must be so, then he was rather inclined to think that the plan adopted at Stafford was the better one—that was, to pay weekly. If they gave a man a year's bonus all at once, the results could not be so good. As to the third system mentioned by Mr. Carder, he did not see exactly how it worked. Most corporations wanted a certain profit; and the price of gas had to be regulated to the amount they considered a proper one to devote to the rates. He was particularly interested in the matter just now, as he thought they must do something of this kind, if they were to make their men take a thorough interest in their work. It was not so difficult for a skilled man to be interested, because his work was less monotonous. This was the secret. If a man's work was very monotonous, he was bound to get tired of it. So that the idea particularly applied to the case of the labourers—the men who were doing the dull, wearisome jobs—and not so much to the works mechanics, &c. But the latter should certainly be included, because, being naturally of superior education, they could come along with suggestions as to more economical ways of doing their particular work.

Mr. Ramsden, in reply, said he must leave the members to judge whether the Stafford scheme of profit-sharing based on the wages factor only was better than the one adopted at Burton, which was based on the net cost of gas. From the point of view of the town, he thought the Burton scheme was the better, because it was just as much to the town's interest that the men at the gas-works should be careful with materials. But from the way in which the two schemes had worked out in practice, he must, as a profit-sharer, say from a personal point of view he liked the Stafford scheme. The reason 2s. per 1000 cubic feet was fixed on as the basis at Burton was because this happened to be the price at which they were selling gas at the time. What he was desirous now of bringing about were periodical gatherings of the men to discuss points affecting the interests of the department; but he had not yet been able to manage it. A few months ago, he had a visit from Mr. Munday (the Secretary of the Labour Co-Partnership Association), who said this would be very useful if it could be started, and would lead to a better feeling between the men and the employers. It was rather a coincidence that since he had started writing these notes there should have been an application made at Burton for a further heavy advance in wages—namely, 1s. per day all round. He would like, in conclusion, to call attention to some remarks made by Sir William Lever at the Manchester Athenæum. He said: "It must be admitted that, in spite of better conditions of employment and higher wages, the present position occupied by labour was not acceptable to the workers. The workman was no longer a 'hand;' labour to-day was an educated man; and his wants were growing and his outlook was extending. Labour would not be brought to work side

by side with, and to harmonize with, capital merely by ever higher and higher wages, shorter and shorter hours, combined with better and better welfare conditions. The lesson for the capitalist was that high wages, short hours, and good healthy conditions, by increasing the intelligence and efficiency, increased output and actually reduced costs. And the lesson for labour was that increased output stimulated consumption, and, consequently, demand for production and distributive labour; the fact being that consumers of all classes supplied themselves where they could be best and most economically served. Only by the entrance into co-partnership together could capital and labour be brought to pull together; and only by co-partnership could they be really harmonized."

Mr. VALON said that, with regard to Mr. Bell's criticism, all he could tell them was that he himself was not responsible for the alteration in the scheme. It was made before he went to Stafford. As to whether the basis should be profit or wages, might be a moot point; but he considered that a bonus scheme should be based on things that the men had under their control. The men had no hand in the purchase of such materials as coal. The make of gas was the management's look-out. If the management was alive, he did not think the workmen had a very great say in the gas production. A good staff would get almost all there was out of the coal, irrespective of the workmen. But the workmen had an interest in getting as much gas as possible, because they knew that the more gas there was the cheaper it was per 1000 cubic feet in the matter of wages, which was what influenced them. If there was a very small make of gas, the workmen would be penalized. No doubt, it was very good for a company to give the employees their share in the form of scrip; but corporations had no power to do this. They must give it in money; and from his experience of the last eighteen months, he was of opinion that it was better to give it weekly than yearly. The men were not used to handling considerable sums of money. He came in contact with his men, not only at the works, but away from them; and he had found now they were getting the bonus weekly the home standard was much improving. He had just formed a War Savings Association at the works; and nearly every man up to now had intimated that he would like them to stop something each week for this purpose, which showed a desire to save money. If a man "lost a quarter," he lost his bonus; they did not allow any latitude at all.

Mr. W. S. MORLAND (Gloucester), in proposing a vote of thanks to the authors, said that at Gloucester they had had a profit-sharing scheme for the past eight years, and had found it very successful. He was pleased to say they had worked harmoniously with their men. Their system was to pay the men ½ per cent. for each 1d. reduction, starting with gas at 3s. per 1000 cubic feet. The men were paid the money annually; it was allotted to them when the accounts were made up. The Company retained one-half as long as the men remained in their employ; paying them, he thought, 4 per cent. on the money. They also had a savings scheme; allowing the men the same interest on money put in. In many cases, the Company found the men did not even take out the withdrawable half of their bonus. The point was that many workmen had never been in the habit of saving; they did not understand it. But if the Company retained the money, and kept it for them, they soon began to feel that they would have a fair amount of money when they were getting on in life, and so came to take a keen interest in saving, not only their bonus, but some of them as much as 2s. 6d. a week in the savings scheme besides. In this way, they were accumulating a good deal of money. If they could induce the whole of the working-class community of this country to save money, it would be a splendid thing. He could not agree with Mr. Valon that the production of gas did not depend on the men; it depended upon them very largely. An inexperienced man could waste more than his wages by doing his work inefficiently. A good stoker knew how to carbonize the coal as well as the manager; and the thing was to get him to do it properly. This also applied to the other workmen in the matter of wasting materials, &c. The idea of profit-sharing was to prevent this taking place.

The Manchester and District Junior Gas Association will, on the invitation of the Engineer and Manager (Mr. A. H. Smith), visit the Darwen Corporation Gas-Works next Saturday. They will be the guests of the Mayor and members of the Gas Committee at tea, after which Mr. H. C. Applebee, of the Bradford Road Gas-Works, Manchester, will read a paper on "Toluol Extraction."

An American Gas-Turbine.—The principle of operation of a gas-turbine introduced by the Detroit Gas-Turbine Corporation, and described in "Power," consists in compressing a charge of the mixture, firing it at constant volume in an explosion chamber, which results in a very high pressure, and allowing the products of combustion to impinge on a series of moving and stationary blades. The arrangement shown consists of eight radial gas-compressor cylinders, which compress the gas mixture to about 90 lbs. per square inch, prior to its discharge into firing-chambers round the periphery of the turbine, from which the products of combustion at high pressure impinge on two rows of moving blades separated by a row of stationary blades. The moving blades are carried on the outer casing, which revolves about the driving-shaft. There is a shaft speed of 3000 revolutions per minute, which corresponds to 24,000 explosions.

NOTES ON PURIFICATION.

By W. C. JONES, of Brierley Hill.

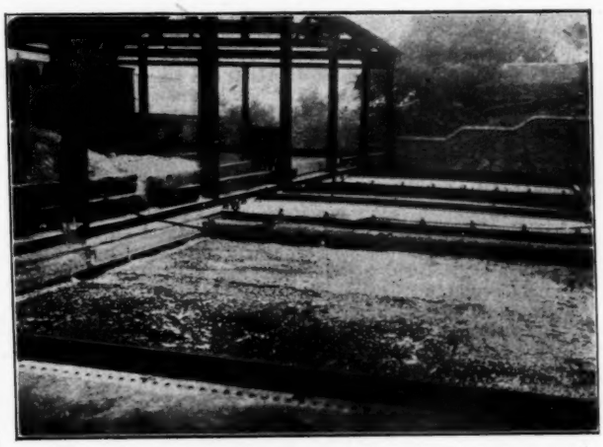
[A Paper read before the Midland Association of Gas Engineers and Managers, Oct. 26.]

A year or two ago, I promised our respected President that I would endeavour to contribute a paper on "Oxide Purification" during his year of office. I had hoped to give particulars of experiments made with various oxides and methods of working; but owing to unforeseen circumstances, and the extra amount of work and worry caused by the present national crisis, I have only been able to prepare these few brief notes. They have, however, the merit of being records of actual practice, and work carried out in accordance with the conclusions arrived at from the afore-mentioned experiments. The subject of purification is one that must appeal to every gas engineer; and I hope these notes will promote a good discussion for our mutual benefit.

I pass over the preliminary processes of purification which have taken place up to the inlet of the oxide purifier, and assume at this point the gas is free from ammonia and tar-fog, but contains, with other minor impurities, sulphuretted hydrogen and other sulphur compounds. The first-named must be entirely removed, and the latter reduced compatible with economy.

The first consideration for efficient and economical oxide purification is the size of boxes necessary. I will suggest that the superficial area of each box equals in square feet the maximum daily make of gas in thousands. This may appear to be excessive; but I know from practical experience that it is efficient. Good results can be, and are, obtained from smaller boxes; but when new ones are being installed, the above size should be adopted.

At Brierley Hill, we have four boxes 20 ft. by 20 ft. by 6 ft. deep; and our maximum daily make of gas has not yet reached 400,000 cubic feet. The connections are arranged so that all the



Photograph showing the Deposition of Naphthalene Crystals on the Oxide.

boxes are at work together, or any number off. Each box is provided with hurdle-grids, and has a pipe for the supply of air or steam.

The next question is the selection of suitable oxide; and when selecting bog-ore, I venture to assert that very often the one containing the largest percentage of iron and the lowest percentage of moisture is the one that should be avoided. Where two samples of bog-ore are submitted—one containing (say) 40 to 45 per cent. of moisture, and the other containing 55 to 60 per cent. of moisture, and where the physical condition appears to be the same—I should, without hesitation, choose the one containing 55 to 60 per cent. of moisture. The best bog-ore I ever used was one that contained 59·5 per cent. of moisture. The iron in a good purifying material is in a better state of hydration, and consequently will carry more water, than when the iron is practically in the state of Fe_2O_3 and nodules of iron. It is for this reason I prefer this method of selection to chemical analysis. When in doubt, add water to the sample with the least moisture, to make it equal to the other sample in moisture. If it becomes a pasty mass of mud, reject it; but if it still retains its granular and friable condition, you will do well to accept it.

With reference to artificial oxides, or oxides that require preparation, the following hints may be useful. To lighten the oxide, manure obtained from stables where moss litter is used for bedding is preferable to sawdust or coke breeze; but, whichever is used, sufficient should be added to make the mass of granular or friable condition when well moistened, adding as much water as possible. Before adding the water, the mixture should be tested by placing a handful in a large jar of water, stirring well, and then testing with litmus paper, which should immediately turn blue. If it does not do so, ammoniacal liquor may be used for mixing, or some other alkali added to the mixture.

The method I have adopted of working the boxes may be

described as the backward rotation system; the last box in the series always becoming the first at each change—*i.e.*, 1, 2, 3, 4; 4, 1, 2, 3; 3, 4, 1, 2; 2, 3, 4, 1; 1, 2, 3, 4. The change is made when sulphuretted hydrogen is shown to be passing the outlet of the second box in the series. No catch-box is required, as the last box is always in the best condition for sulphiding. When making the change, air is admitted at the inlet of the second box in the series; also occasionally steam is admitted. This depends upon how long the oxide has been in use, and the temperature of the material. The quantity of air that may be safely used is anything up to 5 per cent.—depending largely upon the area of the boxes to the quantity of gas passing through. Small boxes will require the most air. The chemical action of oxidizing and hydrating the sulphided oxide is very much quicker than the sulphiding action. Therefore the material in the second box will be revivified before the material in the first is sulphided.

It is not possible to adopt this method of working where a centre-valve is in use. In these cases, it is well worth considering the advisability of scrapping the centre-valve, and replacing with single valves, and arranging for the downward flow of gas.

It was in July, 1909, that I commenced collecting data from which this method has been evolved. At first, the boxes were emptied after being in use six to seven months; but for several years since adopting this method, they had remained without emptying for 22 to 34 months. Until we started tar-washing, the back-pressure rarely exceeded 5-10ths of an inch per box; but recently we have had a lot of trouble with naphthalene in the boxes. This I have cleared in several ways—first, by steaming and adding vapour of petrol, and once by lifting the lid of the box and spraying the oxide with water containing "Solvit."

During the last few years, the new oxide has been placed in the box, and when removed from the box sold direct. With one sample of bog ore, it was placed in the box containing nearly 60 per cent. of moisture; and when removed and sold, it contained 6·8 per cent. of moisture and 61 per cent. of sulphur. This was the best result I ever obtained. The sulphur in this material is usually between 40 and 50 per cent.

With reference to sulphur compounds other than sulphuretted hydrogen, I regret being unable to say what effect the backward rotation method will have in all cases, as so much depends upon the primary processes of purification that the gas has been subject to before reaching the oxide boxes, and also upon the class of coal used and the method of carbonization employed. At Brierley Hill, we use North Staffordshire and South Yorkshire coal, carbonized for twelve hours, at a good heat, with full retorts, obtaining a large yield of gas, but a low yield of ammonia, per ton of coal. Under these conditions, the sulphur compounds have varied between 19 and 30 grains per 100 feet of gas, as tested by the Referees' method; the lowest results being obtained when bog ore rich in organic humus has been in use, as the humus has a powerful action on sulphur compounds—splitting them up and liberating sulphuretted hydrogen. It is for this reason that new bog ore should never be put in the last box of the series, unless a catch-box is also in use.

In conclusion, I would strongly advise any who have not already done so, to read the last report of Mr. W. S. Curphy, the Chief Alkali Inspector—or at least the portion of it published in the "JOURNAL OF GAS LIGHTING" for Sept. 26. The report is an education itself on gas purification and the action of oxides of iron. Much useful information will be obtained from it, and directions indicated for further research work.

DISCUSSION.

The PRESIDENT (Mr. C. H. Webb, of Stourbridge) said he was glad Mr. Jones had been able to give them his promised paper. He had been suffering from illness; and there was some fear that he would not be able to be present.

Mr. J. FERGUSON BELL (Derby) said that, in order to initiate the discussion, he would like to make a few remarks on what they had just heard from Mr. Jones. The author had told them that the size of his boxes was 20 ft. by 20 ft. by 6 ft., that he had four of them, and that his maximum daily make of gas had not yet reached 400,000 cubic feet. Well, it was not everyone who could have so liberal a purifying area. There was, however, no doubt it was an advantage to have good large boxes. It assisted purification very materially; for, as Mr. Jones had pointed out, he allowed his boxes to run something over twelve months without changing. Therefore he had practically adopted closed purification. Mr. Jones said that where two samples of bog ore were submitted, one containing 40 to 45 per cent. of moisture and the other 55 to 60 per cent., and where the physical condition appeared to be the same, he would prefer to buy the one containing the greatest percentage of moisture. Personally, he (Mr. Bell) would reject them both. He generally bought oxide with about 25 per cent. of moisture; and if there was anything more than this, he claimed a reduction. Mr. Jones seemed not to altogether trust to chemical analysis, and they need not do so; but chemical analysis of the oxide was a very good indication of the material, and though the physical condition was very important, yet he always had his oxide tested in the laboratory to see what percentage of iron it contained. He agreed that it was undesirable to add either sawdust or coke breeze; and he never heard before of manure being added. Personally, he did not think it was wise to add any of these ingredients. What he did with very active new oxide was to take two-thirds new and one-third old; and mixing the two, he got an oxide which would work. The plan of allowing a little ammonia to go forward, or putting ammoniacal liquor with the oxide, was good, if one found it was not active enough. The backward rotation system was an excellent one; and he could strongly recommend it, after having had it at work for several years. It seemed, however, to him that a better plan than changing the rotation every week or two was to change it every day, or every second day. With reference to the percentage of air that could be used, probably they could go up to 5 per cent., if they were not drawing-in air in any other way. But many of them got air from other sources; and he would advise the exercise of great care in the matter. His own experience was that, when oxide was very active, and a large percentage of air was admitted, the result was firing in the boxes, with a large amount of sulphur compounds. He had known these compounds to go up from 30 to 120 grains in a few hours; and this was the result of firing in only a small pocket of oxide. He preferred to limit his air to 2 per cent., and lower than this, if possible. What they wanted to do was to sell gas containing heat or light units, and with as little inert gas in it as possible. The condemnation of the centre-valve he could not agree with; and he believed the Weck centre-valve was one of the best introduced. As a matter of fact, he had installed it in many works; and it had given very great satisfaction. There was really no reason at all why anybody should scrap his centre-valve, if he had a modern one. Speaking of sulphur compounds, the author said these should be reduced "compatible with economy." This was a very indefinite expression; and the question was, what was compatible with economy. Of course, they ought to reduce the compounds to as low a limit as possible. At one of his works he was using lime in order to get them down to within 30 or 40 grains. He was glad to learn that, with North Staffordshire coal, Mr. Jones was able to get his sulphur compounds down to between 19 and 30 grains per 100 cubic feet of gas. When he (the speaker) used this coal some years ago, he generally found his sulphur compounds nearer 50 grains than 19 to 30. Therefore he congratulated the author upon being able to get down to 30 grains, or anything like it, with this coal. It seemed to him that it was better to endeavour to reduce the sulphur compounds before the gas entered the purifiers, by washing with strong ammoniacal liquor, which had an action on the compounds, rather than trust to any reduction in the oxide boxes. Oxide purification was simple, cheap, and efficient so far as sulphuretted hydrogen was concerned. There was no reasonable excuse for anyone sending out gas containing sulphuretted hydrogen. The only thing he was sorry for was that they had not been able to evolve any simple means of reducing the sulphur compounds. There were, of course, a French system and Mr. Carpenter's system, both of which were well worthy of consideration. He would like to say that he was one who for very many years had been strongly of opinion that they ought not to send out gas containing a great quantity of CS_2. They should distribute gas which would not give rise to any serious complaints; and if it contained from 40 to 60 grains of sulphur, it would cause complaint. With anything over 30 grains, gas had an action on heating apparatus, burners, and other appliances, which was very detrimental.

Mr. B. W. SMITH (Walsall) said he was quite in agreement with Mr. Bell's remarks. In his own case, they were continually changing—reversing the boxes nearly every day. If they kept the boxes in use too long, it would be found a very hard job to get the oxide out, besides which he did not think there was much advantage gained by keeping it in too long. With regard to sulphur compounds, the only means of stopping bisulphide of carbon was by washing thoroughly, as he was doing, with strong ammonia. This not only helped them in sending away stronger liquor than otherwise, but at the same time it eliminated a portion of the sulphur compounds.

Mr. W. H. JOHNS (West Bromwich) said he thought credit was due to Mr. Jones for having prolonged the life of the purification system at Brierley Hill. So far as West Bromwich was concerned, they had been trying to do the same thing. Owing to the difficulty in obtaining sufficient labour, he was of opinion that it was now necessary to run the boxes as long as they possibly could. By so doing, as Mr. Smith had said, the oxide became very hard; but there was no difficulty at all with regard to the breaking-up. The difficulty was in getting it out of the boxes. Once it was removed, it could be easily broken up by a disintegrator. They had been able to run boxes at West Bromwich for over twelve months; but they had not the advantage of excess purification area, such as existed at Brierley Hill. The West Bromwich boxes were designed to deal with 2 million cubic feet per day, and the maximum output had exceeded this; but they had been able, by careful working, to run the boxes, as he had said, for a period of twelve months. The oxide had not been specially prepared. It had simply been mixed with ordinary coke breeze, similarly to what was done in Mr. Copp's time, which system had been continued. They found that it was necessary to change the catch-boxes very often at one time, due to the Weck valve being out of order; but by giving close attention to this, and preventing the gas being bye-passed from the sets to the catch-boxes, they were able to run the latter much longer than previously.

Mr. SMITH asked to be allowed to add that the oxide he was at present using was 75 per cent. of an artificial oxide and 25 per cent. of a natural oxide, which was Westbury. By this means, they prevented any possibility of back-pressure. At the same time, it revivified very actively; and very good results were obtained in the matter of take-up. With regard to the addition of air, his opinion was that it was difficult to judge the amount that

could be admitted, because, as Mr. Bell had said, it depended on the quantity that was going in from other sources, and also on the amount of inert gases they were allowing to mix with their gas. It seemed to him that 1¾ or 2 per cent. was quite sufficient. Beyond this, they would be getting on to dangerous lines. Some years ago, he had a very unfortunate experience with regard to air getting in. It came from a defective hydraulic main; and the first sign was an explosion in one of the boxes—showing that, if they had their gas heavily charged with air in a foul box, there would in all probability be spontaneous combustion.

Mr. G. STEVENSON (Long Eaton) said it seemed quite fitting that they should have their minds refreshed with regard to the sulphur question, because some few years since, when the sulphur clauses were repealed, there was, he was afraid, a disposition to under-rate the matter altogether. They were perhaps not so careful as they had been when tested against by the authorities. In his opinion, although a quantity of sulphur of even 50 or 60 grains was relatively very small, they must subordinate all this question to the consideration of the great fact that they were now in many cases subject to keen competition; and the cleaner they could send out their gas, the more likely would they be to secure new business and to retain that which they already had. A reduction to (say) 20 grains was well worth the trouble and cost involved. He agreed with Mr. Bell that the indiscriminate use of air at the same time that one was over-pulling was disastrous. The great benefit of air could only be obtained when they were not pulling anything in the retorts. He had had constant tests with the rotation system working four boxes; and nearly the whole of the work of purification with regard to sulphuretted hydrogen was done by the first box. He had had some very striking results. Taking the sulphur at the outlet of the scrubbers, and the quantity at the outlet of each box, it was astonishing how much work was done by the first box. In his case, they were helped by the fact that they had a large excess of condensing and scrubbing power, and their boxes were even bigger than Mr. Jones's. He agreed that time-contact and area were everything. But he understood the theory generally accepted with regard to the science of the backward rotation system was that by the admission of air or oxygen, the first box became so active in absorbing sulphuretted hydrogen, that it sent forward the oxygen, which did its work in the further boxes. This being so, it was very necessary to carefully watch the working of the boxes, and constantly test them. He would also suggest that the temperature of the purifier was very important. In his own case, he was sorry to say, the purifiers had no covering; but he was quite convinced it paid well to put them under cover, so as to get a fairly even temperature. One of the great points about the backward rotation system was taking the gas downward, instead of upward, because, if there was excessive caking, probably the saving was absorbed in broken grids and extra labour on the oxide. At Long Eaton, they had made a profit for many years; and most of them, he thought, were making a profit to-day. He would like to have brought to their notice some system which would enable them to send out the gas even cleaner than they were attempting to do to-day. After all was said and done, other manufacturers did not cease endeavouring to improve their commodities. The more they did so, the more saleable the article became, and the more likely the maker was to retain his business.

Mr. H. E. COPP (Etruria), referring to Mr. Bell's remark about North Staffordshire coal, said he himself was in the position of having to use it; and he very seldom had observed the sulphur compounds more than 30 grains. He could not tell them why it was, except, of course, that they had employed a certain amount of washing with strong liquor, which might have that effect. He did not think it was advisable, in the interests of the industry, that gas should be sent out exceeding 30 grains, because wherever there was an escape of products of combustion—wherever there were gas-steam radiators at work—if there were more than 30 grains, one was bound to detect it. It was very marked indeed. One interesting fact he would like to state was that that morning he had opened a box which had passed 410 million cubic feet. Of course, they used backward rotation in the customary way; but unfortunately he was unable to work the boxes downwards. They were exposed to the atmosphere; they were not shut in at all. Temperature control was effected by injecting the air by means of steam. He could put any proportion of air he wished into any box, accompanied by the amount of steam which it needed to drive it forward, and in this way control the temperature in any of the boxes, which was one of the great things in getting these large quantities of gas through a purifier without any change.

Mr. S. TROW SMITH (Malvern) said that, so far as his experience went, the question of purification depended entirely upon capacity. With an excess of purifying capacity, one did not have anything like the trouble that he would experience when he was under-powered. He himself was in the fortunate position of being largely over-powered, inasmuch as he took a purifier off last month which had been in use two years. They used either the forward or backward rotation, and reversed according to the condition of things. There was a catch-box at the end. Mr. Jones in his paper said he added as much water as possible to his oxide; but he (the speaker) thought this was rather a mistake. Everything depended upon how much water the oxide would absorb. Some oxides would absorb so much water that they became very pasty; and if oxide was put into a box in this condition, they were bound to experience either great trouble with back-pressure, or later on get the gas bye-passing. With reference to putting in 5 per cent. of air with the addition of steam, everything depended upon how they controlled the steam. When the ammonia was taken out of the gas, the gas carried away a certain amount of moisture from the washing. Why add water to it—for this was what it amounted to? Personally, he had dropped steam addition entirely. He would like to ask whether Mr. Jones could give an analysis of the gas entering his holder with 5 per cent. of air put in. There would probably be found a great deterioration in its quality. He (Mr. Smith) never went beyond 2 per cent. of air; and he thought from 1½ to 2 per cent. was quite sufficient for their purpose. When a box began to foul, he reverted to the forward if they were on the backward rotation, or to the backward if they were on the forward rotation. Mr. Bell had suggested the adding of old oxide to the new, instead of sawdust; but at the present price of old oxide, it would hardly pay to keep it on the ground. With existing rates, it was distinctly advantageous to them to get rid of all the spent oxide they could. With reference to the frequency of changing the rotation, he worked on the principle of three days to each box, though occasions arose when it was necessary to change every second day. On the other hand, when they put a new box on, as they did last month, in order to give the others a rest, they found they could run five days without any question of putting an overload on the new box. This gave a rest to the spent oxide, which was revivified, and acted better afterwards. It had, he thought, been an old adage among them that, when oxide got at all sluggish, or a little sour, all they had to do was to bye-pass the scrubber for a few hours, so as to add a little ammonia. The chemical theory went to show that allowing ammonia to go forward in the gas livened-up the oxide at the expense of the cyanogen compounds in it. If one was recovering prussian blue in the oxide, he did not want to let ammonia go forward; but if, on the other hand, one was only looking after the sulphur compounds and sulphuretted hydrogen, he could let the prussian blue or cyanogen compounds go away with the condensation in the purifiers.

The PRESIDENT said they had with them members of a kindred Association, whom they welcomed. They would be pleased for them to join in the discussion.

Mr. J. H. CANNING (Newport) said it was a great pleasure to Mr. Octavius Thomas and himself to be present. There was one point that had struck him (Mr. Canning), not particularly with regard to the backward system of rotation, but with any system which enabled the purifier to remain in operation a considerable length of time without opening; and it was largely connected with a point Mr. Bell had drawn attention to—namely, the percentage of air employed. He understood that in certain cases where purifiers had been kept in operation for much longer periods than any mentioned that day, and where either by accident or by design larger quantities of air than 2 per cent. had been admitted, considerable corrosion of the purifier plates, and even perforation, had taken place. This was a matter to which they should all of them pay great attention. He believed even new sets of purifiers had sustained extensive damage. If they considered the matter, it would be seen that, in boxes where the oxide contained a very large percentage of sulphur, and air was admitted and ignition or partial combustion took place, they had every condition necessary for the production of sulphurous or sulphuric acid. As he had said, this was a point to which great attention should be paid.

Mr. W. G. S. CRANMER (Willenhall) said he could hardly compete with Mr. Jones in the length of time his purifiers ran. His were approximately the same size and proportion to the make as Mr. Jones's; and they used to run somewhere about nine or ten months. But he had a considerable amount of difficulty, when they were running this length of time, with the oxide setting very hard; and, as Mr. Canning had just mentioned, he also experienced damage to the purifiers. In the case of one purifier, practically every joint round it was broken. It happened to be one of some very old purifiers with rust joints. This occurred some seventeen years ago; and though they had done their best to make the joints good, they had been leaking ever since. With reference to the question of the admission of air, his purifiers were out in the open in a very exposed position; and the result was that in the winter they had the greatest difficulty in getting them changed. The only thing, therefore, they could do at times, to avoid sending out dirty gas, was to increase the proportion of air, which they did up to as much as 5½ per cent. They did not pull any furnace gases in, he could safely say. They worked with about 1-10th back-pressure or level gauge on the retort. His experience was that, with more air put in, there was a considerable increase in the sulphur compounds. If they could manage with (say) 2 per cent. of air, their sulphur compounds would be in the neighbourhood of from 20 to 30 grains; whereas if they put in 5 per cent., the chances were the sulphur compounds would go up to 70 or 80 grains. As to the question of the material with which new oxide should be mixed, for the last year or two he had been using spent oxide. He preferred to put something into the oxide to keep it open which was saleable, rather than to add a material which was not. If they added coke-breeze or sawdust, it was worth nothing; but if they put in spent oxide, it was worth money when the oxide went away. With reference to the amount of moisture in oxide, he had always found he could do much better when working as dry as possible. Perhaps if the purifiers were under cover, and they were able to keep them warm, they might do better if the oxide was more moist.

The PRESIDENT remarked that they had for some time been

practising at Stourbridge the system described in the paper; and he was perfectly satisfied with it, as he thought everyone was who had adopted it. In listening to the remarks of the speakers, it seemed all were agreed that downward working was preferable, if it could be adopted. This was obvious from the fact that the gas met a larger surface on the top than when it entered at the bottom and only met the oxide in the spaces of the grids. He was glad to see the members recognized that it was incumbent upon them to keep the sulphur compounds as low as they could, even though the restrictions were not now in force. They must make the article they sold as pure as possible. He was not clear as to why there should be any advantage in changing the boxes (say) daily, instead of allowing them to run for seven to ten days, or longer. Mr. Copp referred to North Staffordshire coal as not giving so high an amount of sulphur compounds as Mr. Bell experienced. Probably the period of carbonization had a considerable bearing upon this. One would expect a different proportion of sulphur compounds when working with light charges and short hours than with twelve-hour charges and full retorts. He did not think Mr. Jones intended it to be implied that all centre-valves should be scrapped, but that if the fact of having an old-fashioned valve precluded the adoption of this system, then it would probably be very good policy to scrap the valve. He would like to ask Mr. Copp where the air was admitted in his case.

Mr. COPP: At the inlet of the purifier. The steam injector easily overcomes the pressure.

Mr. JONES, replying to the remarks made in the discussion, said that Mr. Bell had mentioned that he preferred to buy oxide containing 25 per cent. of moisture. He quite agreed, provided that it was the same oxide that would carry 50 or 60 per cent. His reason for saying this was that when he first started looking into the matter, he bought from a Continental firm, under a guarantee, a certain bog ore to contain on delivery 10 per cent. of moisture. When, however, the bog ore was delivered, it contained 40 per cent. of moisture; but it was in a beautiful condition. Naturally, under the guarantee, he made a claim. It was also guaranteed to contain a certain percentage of iron. When he made his claim for a reduction, the firm disputed it. The matter was then referred to a firm of chemists in Liverpool, who said he ought to make some allowanced for combined moisture; but under the circumstances in which he bought the ore, he combated this. The sellers then submitted the oxide to a firm of German chemists, who agreed with his analysis; and he was then allowed the amount. This happened, as nearly as he could tell, from eight to nine years ago. Very shortly afterwards, an article appeared in which it was stated that the late Mr. Leicester Greville had been consulted by a Continental firm to decide the constitutional formula of oxides of iron contained in bog ore. From his analysis, Mr. Greville came to the conclusion that both the manager and the firm were wrong, inasmuch as the formula ought to be $Fe_2O_3 3HO_2$, whereas the firm claimed that their oxide was in the form of $Fe_2O_3 6H_2O$. He (Mr. Jones) did not himself claim that it was $6H_2O$. He simply claimed under their moisture guarantee, and the firm's own statement as to the condition of the iron. When the firm made the next delivery, they sent it in bags, as they said they were certain it was shipped containing 10 per cent. of moisture. When it arrived, however, the bags were simply shreds, and the oxide again contained 30 or 40 per cent. of moisture. They then came to the conclusion that with this oxide—which was undoubtedly splendid oxide from the purification point of view—it was absolutely impossible for them to ship it from Holland and deliver it with a moisture-content of 10 per cent. In explanation of this, he considered that the bog ore could be compared with a good quicklime, which would take a lot of water to slake it, and when this was done, it was still dry. A poor quicklime would not take anything like so much water, and would yet be a sludge. As to the lightening of the oxide, Mr. Trow Smith had pointed out that spent oxide was worth a good deal at the present time. Another thing was that organic humus had undoubtedly a very great effect on the sulphur compounds; and therefore he preferred this to lighten the oxide—not necessarily as a purifier, but simply as a lightening material. With reference to the point of changing the purifier boxes, he did not say in his paper that he changed the rotation at stated intervals, but that the change was made when sulphuretted hydrogen was shown to be passing the outlet of the second box in the series. One great point he claimed about this system was that there was something definite to go upon as to when a change of purifiers should be made. If they would do as he had said, they would find that the first box had undoubtedly taken up its maximum amount of sulphuretted hydrogen; and there would be time to revivify it before it came into the same position again. They could tell the foreman to test the boxes, and change the rotation as soon as he got the lead test showing at the second box. Mr. B. W. Smith said that keeping the boxes on too long made the oxide become very hard. It did; but up to the present the only difficulty he (Mr. Jones) had found in emptying the boxes with hurdle grids was in getting the centre portion out first of all. After this had been done, the rest was easy. The chemical firm would do the breaking-up. He never did this for them himself, and had not had any difficulty in this respect. Mr. Stevenson was correct in saying the first box did the work; and this was what he (Mr. Jones) wanted it to do. He admitted the air at the second box; and the steam did undoubtedly help to keep the temperature right. By putting in as much water as the oxide would carry, he meant as much water as it would take and yet remain in a fine friable condition. Squeeze it in one's hands, and it would stick together; break it in one's fingers, and it would crumble into little granules. This was what he liked. When oxide was placed in one particular purifier, it contained nearly 60 per cent. of moisture; and when it came out it contained about 60 per cent. of sulphur. Moisture in the oxide took up a certain amount of room; and if they had a very dry oxide, there would be trouble with back-pressure, if the oxide was going to be kept in until it contained 50 or 60 per cent. of sulphur. With reference to the remark about putting in 5 per cent. of air, he thought the speakers had misunderstood him. What he meant to convey was that they could safely go up to 5 per cent. without any danger of fire; but undoubtedly, for most purposes, 2 to 3 per cent. was as much as would be required. It was only on rare occasions that it would be necessary to go up to 5 per cent. He had gone to this figure; and beyond it, he had had one experience of a fire. This was due to the fact that he had one purifier which was giving a good deal of trouble from back-pressure. Probably there was about 18 inches of back-pressure, including the holders and everything else. He did not want to change the boxes at the moment, so he speeded-up the exhauster—forgetting that the air was admitted by a proportional blower fixed to the exhauster. The consequence was that he got beyond 5 per cent., and put the box on fire. It sounded very bad to have a box on fire; but he did not think there was the slightest danger, if the outbreak was dealt with properly. As soon as he discovered there was a fire, he started to steam the box, and got the fire under. When he opened the box, he saw that it certainly had burned one or two of the grid bars, but very slightly. As to centre-valves, he had not been able to work this system with them. At one works he had charge of, there was a centre-valve; but it was one of the old-fashioned type. Although at the works they were only making one-fifth of the gas, it was costing them something to purify, instead of the work being carried out at a profit, as had been done at Brierley Hill for over seven years.

THE HABER AND OTHER SOURCES OF NITROGEN IN THE UNITED STATES.

In a contribution to the "Proceedings of the Smithsonian Institution," Mr. C. G. Gilbert points out that nitrogenous compounds are essential not only to self-defence but to a country's capacity for self-support; and to be effective the source must be such that the product may be adaptable to meet their requirement. The arc method of producing nitrogen compounds has not thus far demonstrated any capacity to meet the agricultural requirement at all, or even the defence requirement efficiently. Definite knowledge concerning the Haber process is lacking. But its record of achievement is against it; and it would seem, moreover, unsuited to American conditions—at least, in the present state of its development. The cyanamide process is capable of a development which will meet the requirements for a cheapened nitrogenous fertilizer source whose form of nitrogen content is readily convertible to nitric acid. The process is already a prominent factor in the economic well-being of most countries of older civilization, and is capable of similar extension throughout the United States.

Bye-product coking operations afford a source of nitrogenous compounds netting the country an annual production at the rate of over 200,000 tons of ammonium sulphate now, and due to raise this total to about 400,000 tons with the completion of the ovens now building. A total of about 700,000 tons would be possible if all coking were of the bye-product nature; and this total should be attained within the next few years. No practicable means for its oxidation to nitric acid have yet been found in America. Bye-product ammonia constitutes the country's one actual asset in the form of nitrogenous compounds. It has a rapidly growing yield of very great importance in itself, but of even greater importance as a factor contributing largely to the commercial possibilities of a number of industrial lines—especially that of coal products.

The country cannot afford to run any risk of checking development along these lines. The evolution of a practicable process for the oxidation of bye-product ammonia to render present resources available, with the development of an atmospheric nitrogen fixation output by the cyanamide process carefully timed to meet the growing demands following a reduction in the retail price of nitrogenous fertilizers, would appear to be the desirable governmental procedure, as being the one least liable to disastrous consequences.

The annual meeting of the Yorkshire Junior Gas Association will be held on Saturday of next week, at Leeds University. After the business meeting, the new President (Mr. Cooper) will deliver his address.

The Scottish Junior Gas Association (Western District) will hold the opening meeting of the session in the Royal Technical College, Glasgow, next Saturday evening. The President (Mr. G. T. Purves, of the Auchengeich Coke-Ovens, Chryston) will deliver his address.

The opening meeting of the twelfth session of the Midland Junior Gas Association will be held in the Medical Theatre of the University, Edmund Street, Birmingham, on Thursday of this week. The new President (Mr. G. C. Pearson, of Birmingham) will deliver his Inaugural Address.

ILLUMINATING ENGINEERING SOCIETY OF AMERICA.

Report of the Committee on Progress.

There was presented by the Committee on Progress of the Illuminating Engineering Society (U.S.A,), at the tenth annual convention, held in Philadelphia last month, a report extending to sixty printed pages, which dealt with a large number of subjects connected with lighting. The Chairman of the Committee is Mr. F. E. Cady.

Gas-Lamps and Appurtenances.

The first section of the report deals with gas-lamps and appurtenances, as to which (and some of the other matters considered) the Committee offer the following remarks.

Burners.—The rapid introduction of the upright lamp fitted with inverted mantles has been the most marked development during the past year. For residences this takes the form of a semi-indirect unit fitted with three small artificial fibre mantles in limp rag form. Outdoor lamps of high efficiency have been developed along similar lines. In these, the bunsens and entire burner-head or manifold portions are within the globe.

The results of an extended investigation on the inner cone of a bunsen flame have been published, and the characteristic conical form explained by the distribution of velocity of the particles in the burner-tube. Incomplete consumption at the surface of the inner cone may be decreased by increasing the pressure. For pressures between zero and two atmospheres, there is a maximum temperature rise for a carbon-oxygen-air flame. The highest attainable temperature for this gas mixture is 2000°.

Ignition.—Engineers have long been seeking a more satisfactory method of ignition than those at present in use; and the most striking innovation of the past year has been the development of a gas-glower for the purpose. This consists of a bundle, cylindrical in form, about $\frac{1}{4}$ inch in diameter, and of about the same length, made up of several thousand filaments formed from rare earth material, similar to that used in incandescent mantles. Gas is delivered to the centre of the mass, and combustion takes place throughout, but with the greatest intensity at the top. The device consumes approximately one $\frac{1}{25}$ cubic foot per hour, or 350 feet a year, which is about one-half that consumed by the ordinary pilot-flame of a residential burner. Among the characteristics of this glower might be named the amount of light that is given off, which is sufficient for the reading of newspaper print at 10 inches distance. But the most distinctive property is the ability to withstand draughts. One side may be cooled below the point of incandescence, while the other will still glow brightly; a rapid rekindling occurring when the draught is removed. In a new pilot for gas-lamps there is a space allowed in the main body of the cylinder for a storage supply of gas that will prevent it sniffing-out when the lamp is being turned on or off. It is claimed that it will not clog-up from impurities, nor be stopped up by pipe-rust, thus overcoming some of the objections to needle-point pilots.

Distance Control.—An electro-magnetic cock has been worked out for the distance control of gas-lamps. It is condensed in form, of simple construction, and may be operated by the current from a single dry battery. It requires no lubricant, and will operate satisfactorily through a considerable range of temperatures.

Mantles, Etc.—For new installations, the upright mantle has been almost completely dropped in favour of the inverted. The great increase in the use of natural gas and the gradual adoption of the calorific standard have caused a rapid extension of the use of incandescent mantles to replace the inefficient flat-flame burner.

A German inventor proposes to use plush of a suitable texture as the fabric for a gas-mantle, instead of ramie or cotton. It is claimed that plush can be impregnated and burnt off as in the ordinary mantle, and that its capacity for emitting light is considerably greater. The process of combustion in a plush mantle would be as follows: The gas mixture issuing from the close meshes of the basic texture, as through a sieve, ignites at the surface, and burns in the channels which run in parallel directions between the threads. The latter glow at their ends with a strong light, which decreases towards the interior. The basic fabric prevents back-lighting.

The shutting-off of the gas supply in order to extinguish lights in case of an air-raid has renewed interest abroad in automatic shut-off valves, which will prevent the danger from open burners when the gas is turned on again.

In the manufacture of gas in Australia, the use of wood mixed with coal has proved quite satisfactory in many of the small gas-works. Boxwood and red gum have been found best for this purpose, being mixed with the coal to the extent of 25 per cent.

As the result of an experiment in which the gas was passed through a tube immersed in solid carbonic acid and ether at $-79°$ C., thus condensing the benzene constituents, it is claimed that the latter are the chief source of luminosity in coal gas. All the ethylene passed forward with the gas; but despite the fact that the volume of ethylene is from three to five times that of the benzene vapour, the former does not apparently contribute much to the light-giving power. In the case of a particular gas, 78 per cent. of the luminous power was lost by the above treatment.

Calorific Standard.—The Public Service Commission for the First District of the State of New York have decided to substitute a calorific standard instead of, and corresponding to, the present 22-candle power luminous standard in gas testing. It is proposed to have a number of testing-stations where calorimeters will be installed for the measurement of the heating value of the gas. A Bill has been recommended to the Massachusetts State Legislature providing for a standard of 550 B.Th.U. for the State. In Chicago, a decided effort has been made to have a calorific standard adopted; and a considerable amount of publicity has been used to educate the public to the value of this standard.

In the Dominion of Canada, an Order in Council has been issued which decrees that 520 B.Th.U. shall be adopted as the calorific standard. It is claimed that this makes Canada the first country to universally institute this standard. Legislation has been started in England to enable any gas company to expeditiously, and practically without expense, make the change from a luminous to a calorific standard. The direct object of this legislation is to promote the extraction of benzol and toluol from town gas. In Switzerland, the Swiss Association of Gas and Water Engineers have recommended that in the case of all Swiss Gas-Works located at an altitude less than 2625 feet, the calorific power of the gas should be 483 B.Th.U. per cubic feet at 60° Fahr. and 30 inches saturated. The net calorific power is referred to.

In America, the tendency in fixing the value for the calorific standard has been towards values much higher than those adopted abroad. In order to ascertain the most useful value, the Bureau of Standards has written to the English Technical Press inviting a discussion by English engineers on the subject.

Effect of the War on Glassware and Thorium.

The war has had a serious effect on the production of glassware of all kinds for illuminating purposes. The shutting-off of the supply of potash from Germany, as well as the difficulty of securing the oxides of antimony, zinc, and manganese, has caused the discontinuance of the manufacture of certain qualities of glass by some factories. The demand for soda ash for use in manufacturing explosives has reduced the amount available for other purposes, such as glass making.

One of the indirect results of present conditions has been the development of additional means for producing thorium from monazite sand in the United States to such an extent that it has been exported, instead of imported, as in the past.

Flood Lighting.

The availability of lighting units of high intensity, together with specially designed reflectors, has caused an enormous increase in the type of spectacular illumination which has become known as "flood lighting." In a discussion before the Chicago Section of the Society, reference was made to the possibility of the production of novel effects, the elimination of glare, operation at relatively low cost, the use of flexible units, illumination of the entire front of a building instead of only parts of it, &c.

Street Lighting.

As the Panama-Pacific Exposition was a striking proof of the value of employing an illuminating engineer for the solution of a specific lighting problem, so the street lighting system of Milwaukee and other well-known installations has already furnished an instructive example of the fact that the scientific application of the principles of illuminating engineering produces results commensurate with the expenditure. As in interior illumination, the tendency in street lighting towards a higher intensity of illumination is still growing.

During the winter, the City of Milwaukee has completed the first section of the new street lighting system. Most of the work is being done this year, and the remainder will be carried out in 1917; a total of 6800 lamp-posts being called for. A feature of this system is that it is designed, when fully completed, to give uniform illumination on each street. This is to be accomplished by a scientific selection of lamps, fixtures, mounting heights, and spacings, and by the use of a specially-designed refractory globe, which reduces illumination below and near the lamps and increases it between units. In determining spacing, it was found that six times the mounting height for down-town streets, eight times for important thoroughfares and in secondary business streets, and twelve times for residential streets using the refractory globe, gave the desired uniform illumination. A single type of lamp-fixture is used throughout; and from the external appearance it is impossible to tell whether it contains a gas or an electric lamp. The illumination values are:

Nature of Street.	Foot-Candle Intensity.
Alleys and outlying streets	0·01
Residential streets	0·03
Subsidiary thoroughfares	0·06
Main thoroughfares	0·12
Promenades and principal business streets	0·50

Interior Illumination.

The possibilities in the use of light properly graduated and directed to produce desired effects in interior illumination, are being recognized. It has been found that an alteration in the illumination in a room may produce a change in the apparent distance of a wall of as much as 10 per cent. A patent has been

taken out for a system of lighting in which the light-source is placed in an opening in the wall, so that the rays of the lamp may be shed into two or three rooms or compartments at the same time. It is expected that sufficient illumination will be obtained to meet the requirements of bedrooms and hallways. Frosted or ribbed glass is used to protect the openings to each room; and shutters are provided to cut off the light when desired.

An interesting illustration of development in the lighting of a modern office building by gas is to be found in the illumination of the new Consolidated Gas Building in New York City. Experiments extending over a considerable length of time were made to determine the system to be employed; and the semi-indirect method was finally chosen. Experimental work was also done to determine the design of fixture, the burner equipment with which it should be supplied, the glassware to be used, and the ignition system most desirable. In the following table are given the illumination values in some of the principal locations:

	Foot-Candles.
Book-keeper's space	6·0 to 7·0
Drafting room	7·0 to 8·0
General office space	4·0 to 5·0
Private office space	3·0 to 4·0
Halls	1·0 to 1·5

Globes, Reflectors, and Fixtures.

Fixtures.—There is a growing tendency on the part of manufacturers to recognize the individual requirements of specific locations, such as stores, halls, offices, living rooms, dining rooms, corridors, &c., and to design fixtures which shall be appropriate for each specific need. For the usual commercial and residential work, the semi-indirect fixture has become the predominating type for both gas and electricity; and efforts are being made to produce fixtures and glassware which will harmonize where the two illuminants are used in the same building. The continued development of new sources has been followed by the design of new fixtures; but more and more there are indications of a departure from stereotyped ideas for both gas and electricity.

Gas.—In the case of gas, glassware has been developed for small units to harmonize with that used for large units when both sizes are employed in the same location. Wall-bracket, boudoir, and semi-indirect portable and table lamps have been brought out in a wide variety of finishes and materials. Semi-indirect fixtures, with a large bowl hiding all the bunsen parts, are being increasingly used in place of the large and massive gas-fixtures with separate arms.

Portable reading lamps having a 6-foot standard and large silk or other cloth shades, have now been adapted for use with gas-mantles. By employing the newest type of burner and a special protecting cylinder of mica, it has been found possible to confine the opening in the top of the shade to a diameter of only 5 inches. No glassware is required.

In order to meet the varying conditions necessitated by the three types of lighting, direct, indirect, and semi-indirect, convertible fixtures are available which, with very little change in the parts, enable the manufacturer to supply any type desired. Such fixtures which have been more or less general in electric lighting are now being made for use with gas and acetylene.

In order to encourage more modern gas-lighting displays in the illumination of fixture show-rooms, a Committee on the subject of lighting fixtures was appointed by the Pennsylvania Gas Association.

By the use of heat intercepting, non-conducting mica cylinders designed for ample ventilation, it has been found possible to use silk shades on gas table-lamps. Mica flour is employed to frost over the outer surface of the mica, thus concealing the mantle and diffusing the light.

Glassware.—Valuable data as to the diffusing and absorbing properties of the materials used in lighting glassware have been worked up and reported to the Society by the Committee on Glare. The delicate colour treatment of decorative china duplicated in glass is one of the developments in shades. The tendency to use denser glass for semi-indirect bowls and shades has grown to a considerable extent.

In England, one of the effects of the war has been to cut off supplies of glassware ordinarily obtained from the Continent. As a result, the Research Committee of the Institute of Chemists of Great Britain have worked out and established the formulæ of a number of important varieties of glass used in special optical and laboratory work. The question of standardizing the various kinds of glassware used for lighting purposes, both as to constitution and quality, has been discussed by the London Illuminating Engineering Society, with the hope of being able to establish the best types and sizes of lamp bulbs, chimneys, globes, &c., in order to support the industry by bringing about economies in manufacture. The shutting-off of the German supply has led the English to undertake the production of heat-resisting glass for use with high-pressure gas and other lamps in which considerable heat is evolved. The fact that almost nine out of ten British factories are working on munitions of war in one form or other, has led to the development of globes and reflectors especially designed for such factory purposes.

Fittings.—The soaring prices of metal fittings abroad, has led to the development of semi-indirect fixtures in which the glass bowl is supported in a holder made of wood. Very decorative effects have been obtained. A screwless support for inverted gas-burner globes has been developed in England. In the suspending lip of the globe, are made three notches or free-ways, through which slip three pins on the inside supporting ring of the burner. A new type of holder for glass shades has its points of support on the inside instead of the outside of the glass. In this way, threaded parts, screws, rivets, and soldered joints are avoided.

Standards.—A special cast-iron traffic post to mark the interception of streets and serve as a guide and protection to pedestrians, has been brought out. It is intended to have it surmounted either by a ruby or a white diffusing globe.

Photometry.

A "flicker" photometer has been devised in which the ordinary cube of a Lummer-Brodhun photometer-head is divided into two parts, from one of which the light coming to one side of the photometer screen is reflected, and through the other light coming to the other side of the screen is transmitted. The cube is rocked back and forth, so that the transmitted and reflected light appear alternately in the observation field.

Photography.

In England, the use of gas lighting for photographic work has not been appreciated, although the subject is being agitated, apparently as the result of work reported in the United States.

Bureau of Illumination.

A bureau of illumination service under the Department of Public Works has been established by the City Council of Milwaukee, and an illuminating engineer has been retained. The bureau will have charge of drawing-up specifications, letting contracts, supervising the installation, and maintaining the new lighting system described earlier in the report. It will include a division of illuminating engineering; and a photometric laboratory is to be established.

Light Sources.

The substitution of artificial light for natural light is being pushed in all directions. In an effort to familiarize the general public with some elementary facts, the Bureau of Standards of Washington has incorporated, in a circular entitled "Measurements for the Household," data on the cost, amount, and distribution of light as furnished by various gas and electric sources.

The idea of using green colour instead of white for the walls of operating-rooms in hospitals has been extended to towels and sheets around the area of the wound to be treated. By this means, light is concentrated where needed, and not diffused. Black has been tried; but it has been found that this gives too much contrast. Ligatures do not stand out clearly against such a background. It is claimed that the relief to the eye by the use of green material around the wound is remarkable. Experience in the States has indicated that neutral gray is the best colour for the background of the field of operation.

EFFECT OF EXPOSURE ON TAR PRODUCTS.

An interesting account of experiments on this subject was communicated to the "Journal of the Franklin Institute" by Mr. Charles S. Reeve and Mr. B. A. Anderton, connected with the Office of Public Roads and Rural Engineering at Washington.

The authors point out that it has been shown on several occasions that changes occur in bituminous materials on exposure to the action of air and sun. Such changes are not due merely to the volatilization of lighter oils, as was shown in a paper upon the subject presented at the Eighth International Congress of Applied Chemistry in 1912, but also to chemical changes in certain constituents of the bitumen—such as molecular rearrangements, inter-reactions, and oxidation. Changes of such a nature were demonstrated in the case of native asphalt and petroleum products by abnormal increases in the percentage of bitumen insoluble in paraffin naphtha, and in the case of tars by abnormal increases in the percentage of free carbon. The present study was instituted for the purpose of extending the work through a greater range of tar products and to determine what relation, if any, existed between the changes brought about by exposure and those produced by laboratory distillations.

Seven samples were chosen, including two refined coal tars, one refined water-gas tar, one refined mixed tar, two tar-asphalt mixtures, and one crude coke-oven tar. The results of their examination were given in a long series of tables, which the authors summarize under the following four headings:

1. Upon exposure to service conditions, tar products materially harden to a much greater extent than can be attributed to loss of distillate alone.

2. The changes which take place (other than loss of distillate) are accompanied by the formation of organic matter insoluble in carbon bisulphide.

3. Tar products containing water-gas tar appear to change to a greater extent than coal tars, as indicated by the greater formation of organic matter insoluble in carbon bisulphide.

4. The comparative consistency of pitches obtained from the distillation of tars to a single arbitrary temperature do not represent the relative behaviour of the tars in service.

At a meeting of the Society of Engineers next Monday, Mr. C. T. A. Hanssen, Assoc.M.Inst.C.E., will read a paper entitled "Heating and Ventilating Private Dwelling-Houses." The points to be dealt with will include the advantages of gaseous fuel.

LARGE SURFACE COMBUSTION GAS INSTALLATION IN AMERICA.

The Eddystone Ammunition Company's Plant.

In the "JOURNAL" for Sept. 26 last, p. 603, a description was given of a large installation of gas-fired furnaces at the works of the Eddystone Ammunition Company, of Eddystone, Pa., for hardening and tempering steel shells. The same firm have also erected two furnaces of the car bottom type, for annealing rifle parts, each capable of taking a charge of 20,000 to 40,000 lbs., and consuming 10,000 cubic feet of gas during the period of heating up, and 5000 cubic feet when the desired temperature has been attained. For a maximum charge the consumption of gas is 72,000 cubic feet; and running for 300 working days in a year at full time, the consumption of gas would be nearly 70 million cubic feet per annum. These furnaces are also fired by the surface combustion system, and can be controlled from a central platform. A flat car with flat fire-brick top surface forms the bottom of the furnace, and is sealed with the walls on either side by a sand seal. Two cars are used in each furnace, meeting at the centre; and there are doors at each end closing-down on the car bed, which extends about 6 inches outside. The cars travel on a line of rails extending through the furnace from end to end, and 20 feet beyond in each direction. They are handled by winches, and the doors by air hoists.

The furnaces comprise a fire-brick lining backed-up with cork brick insulation, and a red brick outer casing with heavy iron buckstaves and tie-rods. A slight pressure is maintained in the furnace, to prevent leakage of air, and each furnace is equipped with twenty surface combustion high-pressure burners. A single valve on the central platform controls the gas supply and, consequently, the temperature; and pyrometer readings are taken at this point, from four couples located respectively at the centre on each side of each car. By these means any desired temperature can be maintained within a few degrees. The combustion can be so adjusted that the flue gases contain no oxygen or carbon monoxide and 15·2 per cent. of carbon dioxide, showing no excess of air or imperfectly burned gases and 100 per cent. efficiency. To guard against oxidation of the charge, however, it is usual to work with 1·2 per cent. of carbon monoxide in the products of combustion. At first the rifle parts were packed in large steel boxes fitted with clay sealed covers, to avoid oxidation; but as experience proved that a reducing atmosphere could be maintained, they were now simply stacked loosely on the car, and the results were quite satisfactory. Two charges could be worked in twelve hours, and the efficiency of the furnace was 15 per cent.—rather a remarkable figure for this class of work.

The method of operating was to place the charge in a cold furnace, turn the gas on full until the desired temperature (usually about 1550° Fahr.) was attained, which occupied about five hours. This heat was kept up for four hours, when the gas was turned off, and the furnace allowed to cool to 400° or 500° Fahr. before the charge was removed.

Gas Manager's Bravery.—Mr. Martin Tracey, the Manager of the Wicklow Gas-Works, last week performed a signal act of bravery, by jumping into Wicklow Harbour, and rescuing a boy who had accidentally fallen in.

Brighton Town Council and the New Gas Standard.—The General Purposes Committee of the Brighton Town Council agreed with a recommendation of the Parliamentary Sub-Committee, with reference to the application of the Brighton and Hove General Gas Company for an Order under the Gas (Standard of Calorific Power) Act, 1916—"That it is advisable steps should be taken to support the objections to the Gas Company's application already lodged by the Town Clerk on behalf of the Corporation, and that the Town Clerk be authorized to retain counsel, agents, and witnesses with this object." The General Purposes Committee pointed out that provision for this expenditure was not made in the estimate of the Committee, the reason being that the Committee did not anticipate any expenditure on parliamentary opposition during the current year. The Committee were unable to give an estimate of the cost which would be incurred, but were of opinion that it would exceed £100. The Council adopted the recommendation, and sanctioned the necessary expenditure.

Municipal Trading Profits and Income-Tax.—When the Treasurer's annual abstract of accounts was presented to the Stockport Town Council, Alderman Graham referred to figures which showed that the Gas Committee charged the General Purposes Committee £7304 for the lighting of streets, and had paid £10,250 in relief of rates; while £4751 had been paid in income-tax. He could not understand why the Corporation should allow the Gas Committee to charge another Committee £7304 for lighting, by which means the profits of the undertaking were increased by this amount, and in consequence the Committee had to pay £4751 in income-tax. It seemed to him that, as the Corporation owned the gas-works, the first duty of the undertaking was to provide public lighting. If this was done, the sum of £7304 would be taken from the profits; and it would save the town income-tax amounting to £3000. Alderman Fernley, in reply, said it was quite obvious to anyone who knew anything about the matter that the Inland Revenue would not be so unwise as to allow the Corporation to spend £7000 a year on lighting without paying income-tax. He suggested that Alderman Graham would do better if he obtained information about a subject before he spoke so confidently on it.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

National Gas Council.

SIR,—If there was a sincere desire on the part of the "Four Sevens" to thoroughly organize the National Gas Council, it is quite beyond human comprehension to understand why the preliminary meetings were all held *in camera*. Surely the twenty-eight members do not represent all the brain-power and wisdom of the gas engineering profession on such an important matter; and I venture to think the members of the Institution of Gas Engineers will expect to hear from those in authority at the meeting next June why this unusual course of procedure was adopted, as such methods are not at all likely to produce the best results or attain the object in view.

No one can therefore be surprised to read that the members of the "S.B.G.I" are not altogether satisfied with the results. The exclusion of the Society from the Executive Committee is absolutely illogical. If the members of this useful but energetic Society are worthy of representation on the Consultative Committee, surely they should be represented on the Executive.

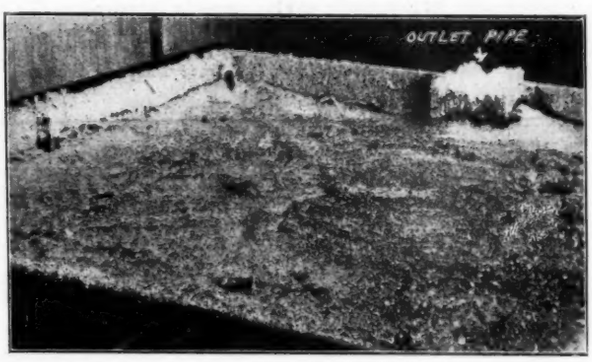
Another point on which information is lacking, and which should be supplied, is, Why was the number of members from each of the four representative bodies raised from seven to nine? Why nine? It is an "uncanny" figure. Three nines are 27; and 2 and 7 are 9. So it goes on up to eleven times nine, 99. Very well, add the digits together 9 and 9 are 18; 1 and 8 are 9. Go on to any extent you like; and you will find it impossible to get rid of the figure 9. Evidently the promoters of the National Gas Council raised the number from 7 to 9 for the benefit of the "S.B.G.I.", as by cutting off the tail of the 9 it becomes 0; and this about represents the position the "S.B.G.I." have been given in the National Gas Council, owing to their exclusion from the Executive Committee.

Again, we see that the men who constantly improve plant for the manufacture of gas, thereby cheapening its cost of manufacture, and those who are intimately associated with the manufacture of all appliances using gas for industrial purposes, and who to so large an extent are responsible by their skill in management of their business and keeping to the channels of industry in this country—work which might otherwise have gone abroad, and will in the future undoubtedly go to Germany perhaps in a year or two—are denied a place in the newly constituted Gas Council cabinet, the right to a seat in which it is so obvious that they are entitled.

Oct. 27, 1916. NEW AGE.

Naphthalene in an Oxide Purifier.

SIR,—Enclosed is a photograph of the top of an oxide purifier just opened for changing. The whole of the top was covered with naphthalene to the depth of 2 inches—making a wonderfully pretty sight. The inside of the cover was even more beautiful, with a mass of fern-like formation. It will be noticed how it banked-up on the top of the outlet of the purifier. It was about 4 inches in height. The photograph I took may be worth reproduction, seeing there is so much talk in England at present about naphthalene and its troubles.



It may be interesting to know that for the twenty years I have been here—and until lately we have been using English coal (Aldwarke Main) and Australian coal—one never saw naphthalene in the works. It did not cause us a moment of worry. Since the war, we have been using Colonial coal from Natal, which is a fair gas coal, giving a good coke, but not equal to English coal.

The tar we get from the Colonial coal yields only 5 to 6 gallons per ton. During the complete use of the Colonial coal for carbonizing we have had our troubles with naphthalene. Our first washer we have to clean out every month, especially the inlet and outlet pipes, being choked with large flaky naphthalene. The washer scrubber (tower) does not give us so much trouble; but the purifiers and oxide are choked with it, and we have found it in the station meter, and lately in the services in town. The peculiar position is this, that we are using exactly the same apparatus, and have the same high heats and all conditions as to manufacture similar to what they were when we used purely English coal. We find, also, that the lower the quality of gas the greater the formation of naphthalene, and the higher the grade of gas the less liability of deposit. With that coal we had not any trace of naphthalene for over twenty years and more; yet with the change of coal we get our apparatus full of naphthalene.

This tends to show that the formation of naphthalene is purely and simply a question of coal, and not due to methods in carbonizing, con-

densing, or any cleaning process in gas manufacture—at least, it is proved so in our case. Could we go back to English coal, all our naphthalene troubles would cease. We never get it really cold here. The temperature of water is generally above 60° Fahr., ranging up to 75°. Yesterday it was 97° in the shade; and winter is not over yet. Climatic conditions do not seem to make much difference to us, as we have as much naphthalene form in summer as in winter.

WILLIAM ARNOTT, Manager.

South African Lighting Association,
Port Elizabeth, Sept. 26, 1916.

Destruction of Household Refuse.

SIR,—I have read with considerable interest the paragraph which appeared under the above heading on p. 120 of the "JOURNAL" dated the 17th inst. As you are probably aware, my Company have recently introduced a "small-size garbage destructor," under the title of the "Davis Domestic 'Burn-All';" and as this apparatus possesses advantages which would appear to establish its superiority over the American stove described in the paragraph referred to, you may perhaps be willing to extend the hospitality of your columns to a few remarks by way of comparison.

The best way to use the American stove, it is stated, is to start it with a thin layer of crumpled paper as a base for the first batch of rubbish, and to deal with successive layers in a similar manner. To describe as efficient a stove that requires this attention to assist the performance of its own special function will scarcely, I think, appeal to your readers as an appropriate use of that much-abused adjective. The arrangement of garbage "in layers" is certainly not an operation with which the average housewife would desire to augment her present duties; and I think it will be agreed that by accepting refuse of any kind "just as it comes" and disposing of it with no more attention than an occasional raking with the poker provided, our "Burn-All" is certainly the more efficient of the two stoves.

Again, it is claimed for the American stove that "frequently the supply of gas is only required for 10 to 15 minutes to start combustion." The use of the word "only" would suggest that, in the designers' opinion, 10 to 15 minutes is a very short time for bringing their stove to combustion point. Now, our own "Burn-All" gets to work immediately it is lighted, though it is true that, to increase rapidity of burning, we recommend that the apparatus should be lighted for 5 minutes (only) before garbage is fed into the combustion chamber. So that if the American stove be rightly termed "economical," I claim for our "Burn-All" that, in this respect at least, it is much more so.

The reference in the original paragraph to the drying of the lower layers of an accumulation of three or four days' waste (besides calling further into question the real efficiency of the apparatus described) suggests to me that the makers of the American stove cannot have studied even the fundamentals of the household refuse difficulty; for the bare idea of collecting a half-week's miscellany of filthy garbage is enough to excite repugnance to the method of disposal suggesting it. In my Company's opinion, a really efficient domestic incinerator should be capable of burning up in a very short time, with an economical consumption and with little or no attention, each day's refuse as it is collected; that it should accomplish this without smoke, odours, or waste of gas; and that the stove should possess the same advantages of ready convenience and simplicity in use as the gas-cooker and gas-fire. These merits are all embodied in our compact little "Burn-All," a single test of which would suffice to reveal to any competent engineer—and for that matter any lay user—the imperfections of the American stove, of which such high hopes would seem to be entertained by the makers.

CYRIL G. DAVIS,
Managing Director, Davis Gas-Stove Company, Limited.

60, *Oxford Street, W., Oct. 26, 1916.*

Bonus for Stockport Corporation Employees.—The Stockport Town Council have adopted by a substantial majority recommendations of the Special Committee on Wages, to pay a bonus of 2s. per week for the period of the war to the stokers and other manual workers in the gas-works, electricity works, tramway department, and the sewage outfall works who have not participated in any war bonus or gratuity, or special increase of wages, and whose wages do not exceed 35s. per week. Workers receiving between 35s. and 37s. per week will have their wages made up to 37s. Amendments that the bonus be 4s. and 2s. 6d. were defeated.

Reduced Water-Rentals at Torpoint.—At the last meeting of the Torpoint Urban District Council, the Water and Finance Committee reported that they had decided to reduce the charges for water by about one-half. The loan on the water undertaking had been paid off, and the people who had taken the water had borne all the cost, besides contributing a profit which had benefited those ratepayers who did not use the town supply. The Chairman (Mr. J. H. Wiltshire) said that during the past few years the consumers, many of them outside the town, had borne an unfair proportion of the cost of the loan. The Council's action was approved.

Exemption Applications.—At a sitting of the Darlington Tribunal last week, the Military Representative (Major Biggs) objected to the Manager of the Gas-Works (Mr. F. P. Tarratt) supporting a personal claim by one of the works' employees; but after having made a statement, the Tribunal said this would be borne in mind. On personal grounds, exemption was granted to the end of the year; but applicant was informed that the certificate would not be renewable unless leave was granted by the Tribunal. At Ripon, last Friday, the Gas Manager (Mr. J. Demain) made application for an inside fitter, aged 32 and married. He explained that the man was the only fitter they had; and owing to the dilapidated condition of the works, it was absolutely necessary to retain him if the gas supply was to be maintained. Temporary exemption was granted for three months. The Mayor assured the Military Representative (Admiral Milton) that every effort would be made to replace the man before the end of the period of exemption. At the same sitting, conditional exemption was granted the foreman of the Ripon Gas-Works.

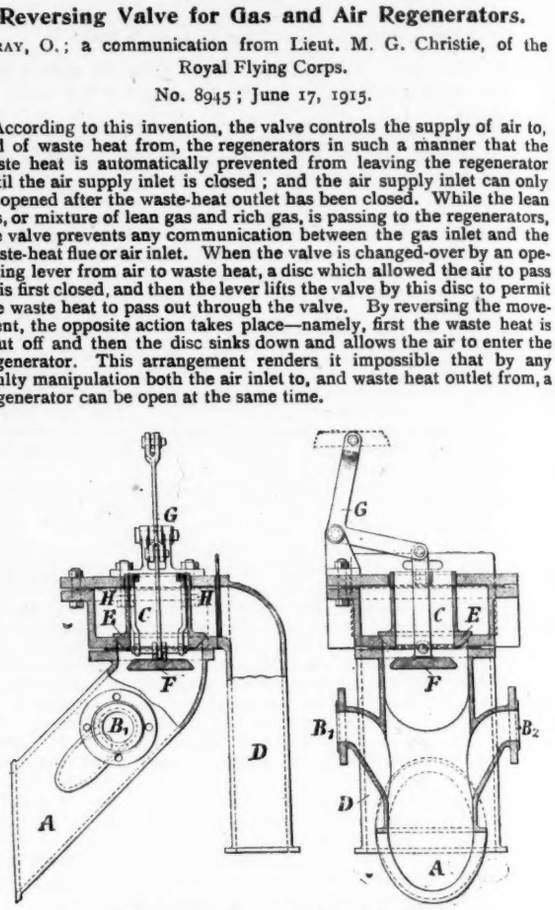
REGISTER OF PATENTS.

Reversing Valve for Gas and Air Regenerators.

IMRAY, O.; a communication from Lieut. M. G. Christie, of the Royal Flying Corps.

No. 8945; June 17, 1915.

According to this invention, the valve controls the supply of air to, and of waste heat from, the regenerators in such a manner that the waste heat is automatically prevented from leaving the regenerator until the air supply inlet is closed; and the air supply inlet can only be opened after the waste-heat outlet has been closed. While the lean gas, or mixture of lean gas and rich gas, is passing to the regenerators, the valve prevents any communication between the gas inlet and the waste-heat flue or air inlet. When the valve is changed-over by an operating lever from air to waste heat, a disc which allowed the air to pass in is first closed, and then the lever lifts the valve by this disc to permit the waste heat to pass out through the valve. By reversing the movement, the opposite action takes place—namely, first the waste heat is shut off and then the disc sinks down and allows the air to enter the regenerator. This arrangement renders it impossible that by any faulty manipulation both the air inlet to, and waste heat outlet from, a regenerator can be open at the same time.



Christie's Reversing Valve for Regenerators.

Two sections (at right angles to each other) show a construction of valve according to the invention.

A is the connection leading to a regenerator; B and B_2, branch connections to the gas-main; C, the opening for admitting air; D, the connection to the waste-heat flue. E is the valve opening or closing the passage from the regenerator to the waste-heat flue. F is a disc seated in the valve E, which opens or closes the passage for the air supply inlet C to the regenerator. A lever system G raises and lowers the disc F; and by means of the disc it raises the valve E. The disc F can be screwed, by bolts H and nuts, to the seating of the valve.

When the disc F is raised so as to shut off the air supply through C, the valve E is lifted, and the waste heat from the regenerators passes through the passages A and D to the waste-heat flue for the required periods. The reverse action occurs when the air supply is to be heated. The valve E is then closed and the disc F lowered to allow air to pass from C into the regenerator. During these periods, the connections B_1 B_2 to the gas-mains are closed by stop-cocks.

When lean gas is used, certain regenerator chambers are allotted to heating the gas and others to heating the air. In the chambers in which the gas is to be heated, the disc F is screwed to the valve E; and for a certain time the gas-cocks leading to the branches B_1 B_2 are closed, and waste heat from the regenerators is passed through the valve E and passage D to the waste-heat flue. At the end of this period, the valve E is closed and the gas-cocks opened, so that the gas can pass below the valve E to the regenerator.

Manufacture of Light Hydrocarbons from Heavy Hydrocarbons.

RITTMAN, W. F., of Columbia University, New York City.

No. 9162; June 22, 1915. Convention date, March 15, 1915.

This invention has for its object the manufacture or conversion of light hydrocarbons, either from crude mineral oils, residuum oils, of from the products thereof. The invention is not limited to the treatment of the mineral oils or their products, but is adapted for the treatment of the liquid hydrocarbons or liquid hydrocarbon products obtained from shale or other substances capable of yielding liquid hydrocarbon products.

The patentee's claims are as follows: (1) A process of manufacturing light hydrocarbons from crude oil or its products, or from heavy hydrocarbons or heavy hydrocarbon products having boiling points above 150° C., which consists of suddenly gasifying the material to be treated, cracking the gasified material in the absence of any liquid, and under a pressure of at least six atmospheres, and condensing such combinations formed by the cracking as will condense at a temperature above

30° C. (2) A process of manufacturing light hydrocarbons, as Claim 1, including the step of effecting the gravity separation of the hydrocarbon gases condensible at a temperature above 30° C. (3) A process of manufacturing light hydrocarbons, as Claims 1 and 2, including the step of passing the flashed hydrocarbons in gaseous condition through a heated chamber of such size as to permit of a rapid subsidence of the heavier hydrocarbon compounds in gaseous form formed by the cracking and as to permit of a relatively slower subsidence of the lighter hydrocarbon gases formed by the cracking. (4) A process of manufacturing light hydrocarbons, as in Claim 1, which consists in subjecting hydrocarbons in a gaseous condition to a temperature of not less than 450° C., and to a pressure of not less than 100 lbs. per square inch, and condensing the hydrocarbons having boiling points not lower than 30° C.

Manufacture of Benzene, Toluene, &c., from Petroleum and other Hydrocarbons.

RITTMAN, W. F., of Columbia University, New York City.

No. 9163; June 22, 1915. Convention date, March 15, 1915.

This invention relates to a process for the manufacture of aromatic hydrocarbons from petroleum hydrocarbons—a process which has been successfully operated on crude oils, shale oils, residuum oils, high-grade kerosene distillates, and other oils and residues.

The process is not primarily one of recovery of benzene and toluene from the materials mentioned in which these constituents naturally occur, but instead it deals with the production or creation of benzene, toluene, and other aromatic hydrocarbons and the like from practically any liquid hydrocarbon product—including mineral oils or the products thereof having a distinctly paraffin base, in which it has been found that practically no benzene or toluene exist.

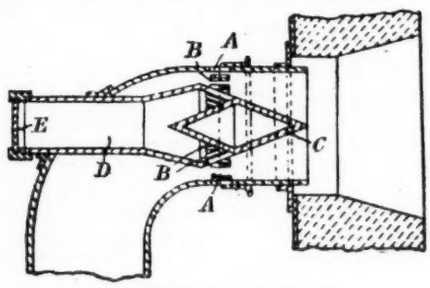
It has already been proposed in processes for converting hydrocarbons of higher into those of lower boiling point to submit the vapours to a temperature not exceeding 410° C. in the presence of a circulating current of permanent gas under a pressure of 10 to 12 atmospheres; the hydrocarbon vapours being submitted to the decomposing temperature in a vessel arranged between a distillation vessel and a condenser, and heated independently of the distillation vessel. According to the present invention, however, the oil is so vaporized as to obtain a uniform mixture in the cracking tube and avoid any necessity for the continual readjustment of temperature and pressure.

Atmospheric Gas-Burners.—No. 100,896.

BRADSHAW, G. D., of Johnstown, Penn., U.S.A.

No. 10,031; July 17, 1916.

This heating burner is said to be especially adapted for consuming blast-furnace or producer gases. It comprises an elbow-pipe of uniform diameter, through which gas is supplied; a core-piece arranged therein; air inlets A in the pipe; and air inlets B formed in the core-piece and communicating with an internal air-supply pipe. The air



Bradshaw's Heating Burner.

inlets are arranged at the point where the effective cross-sectional area of the tube is least. In one form, the core-piece C is constructed as shown; and the end of the internal air-supply pipe D, at which the air inlets B are arranged, is enlarged. The air inlets A are regulated by a flanged sliding regulator, and the outer end of the pipe D is provided with a sliding damper E fitted in grooves, or with a butterfly or other damper.

Manufacture of Gas.—No. 101,152.

RASMUSSEN, C. O., of Copenhagen.

No. 11,136; Aug. 7, 1916.

The patentee deals with the production of illuminating, heating, and like gas from peat, lignite, or wood. The gas is produced in the usual manner in closed retorts or retort-kilns, and is then passed through one or more retorts, &c., filled with incandescent carbonaceous material—such as the residue cinder or charcoal from coal, peat, lignite, wood, &c., from which a part or the whole of the gas has been derived. This action, for converting the carbon dioxide in the gas into carbon monoxide, may be promoted by the addition of water vapour, with a consequent production of hydrogen also. To improve the quality of the gas, hydrocarbons—such as massut, petroleum, coal-tar, lignite, peat, wood, &c.—in fluid or pulverulent form, may be supplied to the retorts in which the decomposition takes place; or the water vapour or hydrocarbons may be supplied to all or some of the retorts where the gas is produced. The gas may be produced in some of the retorts of an ordinary gas-works, and may be mixed with the ordinary coal gas, &c., as made.

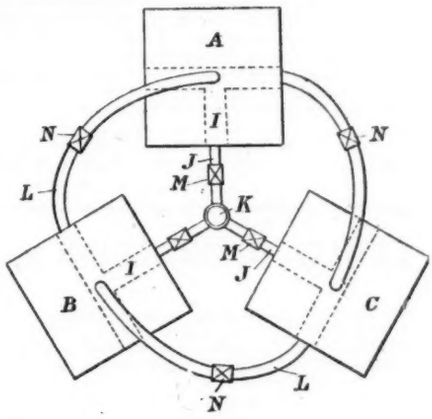
Gas-Fired Pottery Kilns.—No. 101,567.

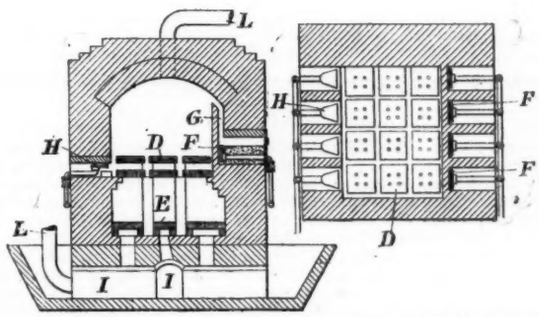
SOUTH METROPOLITAN GAS COMPANY, and DEAN CHANDLER, of Old Kent Road, S.E.

No. 874; Jan. 19, 1916.

According to this invention, the kilns, arranged in sets or groups, are provided with one floor about midway of the height of the interior and another near the bottom. Both floors are perforated and are adapted for supporting articles to be burned. The upper floor is, moreover, hollow—that is to say, there is a space between the floor of the upper portion of the kiln and the roof of the part below, which ceiling is likewise perforated. Burners are arranged on opposite sides of the kilns—one set vertically disposed and projecting flames up a kind of flue passage to the roof of the upper part of the kiln. Another set of burners projects flames into the space within the hollow or middle floor already mentioned. Articles to be burned are stacked upon the middle and bottom floors, and the flames are drawn in a downward direction to the outlet.

In operation, two kilns would be charged and connected in series, while the outlet of the second kiln would be connected to the flue. The first kiln would then be started with one set of burners at low pressure, and later the other set would be lighted and the pressure of the gas would be increased as the gradual drying off of the articles in the kiln permits. After passing through the first kiln, the heat enters the second and begins to dry the articles in it—the draught being regulated by the flue and the compressed air jet in it. When the goods in the first kiln are finished, the burners are put out and those in the second kiln are lighted, the waste heat from that kiln being drawn through a third kiln, which has in the meantime been charged and has been connected to the flue instead of the second kiln, which has been cut off from it. While the second and third kilns are at work, the first kiln may be opened, cooled, emptied, and recharged, and may take its place in the cycle of operations.





Chandler's (South Metropolitan Gas Company) Gas-Fired Pottery Kiln.

A diagram is given showing (in plan view) an arrangement of three kilns adapted to operate in accordance with the invention; also a vertical section and horizontal section of one of the kilns described by the patentees.

A, B, and C are three kilns built of refractory material on a suitable base or tray and furnished with suitable doors. Each kiln has two floors D E, both perforated. The upper floor is also double. The space above the floor is heated by a row of burners F, which send their flames in a vertical direction up the space G towards the top of the kiln. Thence the flames pass around the goods which are piled on the floor through the latter, into the lower compartment of the kiln, which contains goods to be baked or burned piled on the perforated floor E. Auxiliary burners H for the lower compartment send their flames into the space within the double floor, and thence the flames pass through the lower compartment to the outlet flue I. This is connected by a pipe J to the central chimney K, and also by the pipe L with the top of the next kiln of the series. The pipes are furnished with valves M N, by means of which the course of the combustion products from the kilns are controlled.

A special meeting of the Hebden Bridge Gas Board was held last week to consider an application made by the workmen for an increase of wages. It was decided to grant an increase of ½d. per hour to the labourers; and a concession was also made to the stokers, &c.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

Deaths from "T.N.T." Poisoning.

Mr. ROWLANDS asked the Home Secretary whether his attention has been called to the inquest at Faversham on Winifred Oldfield and the inquest on Lydia Elizabeth Gibson, who died of "T.N.T." poison. Could he say how many deaths from the same cause had occurred during the past three months; and what action was being taken to prevent these disasters?

Mr. BRACE: The Home Secretary's attention has been called to both these cases. During the quarter ending Sept. 30, the number of reported deaths from the same cause was 21. The Home Office and the Ministry of Munitions are taking every possible step to investigate and deal with this new source of danger.

Mr. ANDERSON asked the Secretary of State for the Home Department whether he was aware that, of the 472 cases of industrial poisoning reported during the nine months ending September, 1916, 120 occurred from toxic jaundice; and that, of 62 deaths, 33 were attributable to this cause; whether he could state how many of these cases and deaths were due to poisoning from "T.N.T.;" and what action he proposed to take.

Mr. BRACE: The figures are correctly stated in the first part of the question. The number of these cases due to "T.N.T." poisoning was 95 and the number of deaths 28. Every possible step is, as I have already stated, being taken by my Department, in concert with the Ministry of Munitions, to investigate and deal with this disease.

Coal-Tar Colour Industry.

Sir WILLIAM BYLES asked the Secretary of State for India whether the Board of Trade had already advanced approximately £1,000,000 for the regeneration of the coal-tar colour industry; whether the regeneration of the natural indigo colour industry is even more important, seeing that the money value of the industry to the Empire was formerly worth more by 50 per cent. than the whole of the coal-tar colour industry to the country; and whether the appointment of a single investigator and a small expert Committee is all that he proposes to do in this matter.

Mr. AUSTEN CHAMBERLAIN replied that with regard to these points he would refer the hon. member to the President of the Board of Trade.

LEGAL INTELLIGENCE.

Bright Light from a Gas-Works.

At the Frome Petty Sessions, Mr. H. F. Vincent, the Manager of the Frome Gas Company, was summoned in respect of two offences under the Lighting Order, to which he pleaded not guilty. The evidence for the prosecution showed that there was a bright light coming from the retort-house and workmen's room; and the police complained that when they drew Mr. Vincent's attention to the matter, "he treated them with levity." For the defence, Mr. Ames submitted that, as the Gas Company had the Field-Marshal's permit, they were exempt from the Lighting Order. A fine of 10s. in each case was inflicted.

A Satisfied Gas Consumer.

Some few weeks back, the Stafford Corporation had a certain amount of difficulty in one of their districts, due to naphthalene, and received somewhat severe complaints from one of their customers. After having the matter put right, Mr. W. M. Valon (the Engineer and Manager) wrote the consumer asking whether the supply was now giving satisfaction; and in due course he received the following reply: "I gladly give you a handsome testimonial for the great improvement you have effected in our gas supply. Thou hast indeed delivered us from the power of darkness, and no longer do thy humble servants dwell in thought upon

'The knell, the shroud, the mattock and the grave,
The deep dim vault, the darkness and the worms.'

Thou hast pierced the cimmerian gloom engendered by the dim religious light of previous weeks, and made us once again to walk as children of the light."

Loan for Meters and Stoves not Sanctioned.—The Plymouth Corporation Gas Committee, who applied to the Local Government Board for permission to borrow £15,000 to meet an estimated expenditure for meters and stoves in the Devonport area during the next three years, received last week a reply stating that the Board are not prepared to sanction any loans for this purpose during the war.

Lighting of North Tawton.—Correspondence in relation to the lighting contract was laid before the North Tawton Parish Council last week. The Devon Gas Association, with whom the Council have a contract expiring in September, 1917, wrote that, in view of the contract, they could not make any allowance for lamps not lighted. The Council replied pointing out how greatly the lighting had been restricted, and the Association then said that they would accept one-half the usual charge of £2 per lamp. The Lighting Committee recommended that this be accepted, on condition that the reduction should apply to the period of the contract. It was pointed out that the number of lamps lighted had been reduced by two-thirds, so that the sum to be paid under the proposed arrangement would be £3 per lamp actually lighted.

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Annual General Meeting of the Association was held last Thursday, at the Caxton Hall, Westminster, S.W.—Mr. H. E. JONES, the Chairman of the Committee, presiding.

The attendance register was signed as follows: H. E. Jones, Chairman, Leslie E. Clift (Redditch), E. J. K. Fussell (Tottenham), George Clarry (Cardiff), W. B. Farquhar (Ilford), R. W. Edwards (Aldershot), T. May (Richmond), L. Trewby (North Middlesex), W. Belton (Shrewsbury), Samuel Tagg (Preston), R. B. Anderson (Waterford), George Andrews (Swansea), D. H. Helps (Reading), W. E. Vinson (Gloucester), Alex. A. Johnston (Brentford), C. W. Braine (Wandsworth), F. W. Cross (Lea Bridge), Chas. F. Botley (Hastings), J. R. H. Jacobs (Southampton), W. A. Schultz (Ascot), W. E. Price (Hampton Court), T. H. Hazell (Newport, Mon.), Sydney Y. Shoubridge (South Suburban), Gerald H. S. Iorns (Ilford), H. E. Bloor (York), D. Milne Watson (Gas Light and Coke Company), Thomas Berridge (Leamington), H. O. Carr (Wandsworth), and C. Hulme (Uxbridge).

The SECRETARY (Mr. F. E. Cooper) read the notice convening the meeting; and then the minutes of the meeting held on Oct. 29, 1915.

THE LATE SIR CORBET WOODALL.

The CHAIRMAN said that, before proceeding to the ordinary business of the meeting, he was sure the members would like to express their sense of the great loss the Association, in common with the whole gas industry, had experienced by the lamented death of Sir Corbet Woodall. From the minutes that had just been read, it appeared that he (the Chairman) had, at the last meeting, to refer to the loss of two conspicuous figures in the industry—Professor Vivian B. Lewes and Mr. Edward Allen, of Liverpool. But it certainly did not often fall to the lot of the Chairman to record, and to ask the sympathy of the members for a resolution regretting the loss of so distinguished a figure as that of Sir Corbet. He was for many years identified with the Association. He always supported it cordially and generously; and his great position with the premier Gas Company enabled him to substantially back-up his co-operation, so that their funds at all times, when they were testing difficult questions, were, through his beneficent influence, well supplemented. He should like the members to stand in their places to approve that a resolution be sent to Lady Woodall, expressing their deep concern at the death of the late Sir Corbet Woodall, and their profound sympathy with her and her family.

The resolution was passed by the members silently rising.

ANNUAL REPORT OF THE COMMITTEE.

The annual report of the Committee was then presented. It read as follows:

The Committee herewith present the revenue account and balance-sheet, together with a report of the proceedings of the Association for the year ended Sept. 30, 1916.

The expenditure amounted to £424 4s. 3d. The revenue was: Subscriptions, £523 19s.; Interest on Consols and 4½ per cent. War Loan (less tax), £132 12s. 6d.—amounting together to £656 11s. 6d., and leaving a surplus of £232 7s. 3d. The balance-sheet shows that the assets amount to £3323 10s. 5d., consisting of £3427 4s. 1d. 4½ per cent. War Loan 1925-1945, balance at bank £90 14s. 11d., and cash in hand £5 11s. 5d. From this total must be deducted the amount owing to the bankers—namely, £2150—leaving a balance in favour of the Association of £1373 10s. 5d. Since the date of the last annual account, the Association's bankers have advanced £460 on loan to complete the purchase of 4½ per cent. War Loan necessary to convert the Association's holding in Consols. This conversion has been carried through; and the Association now holds £3427 4s. 1d. 4½ per cent. War Loan, 1925-1945. The Association have reduced the amount owing on loan to their bankers during the year by £600; leaving the amount now owing on loan £2150.

The Committee considered the request of various Gas Committees that steps should be taken by the Association with reference to the suspension of the operation of the sliding-scale owing to the war, and decided that they could not do so. But the Companies concerned were advised to approach individually the Board of Trade in the matter to see if the said Board could give them any assistance.

The question of the proposed pooling of privately owned railway waggons was considered by the Committee; representations upon the subject were made to the Board of Trade; and a deputation was appointed to lay their view before the Board of Trade in the event of the Board of Trade deciding to proceed with the matter,

The Price of Coal (Limitation) Act, 1915, was considered further by the Committee in connection with a circular issued by the Monmouthshire and South Wales Coal Owners' Association as to their interpretation of the Act, and the Board of Trade received deputations from the Association and others on the matter.

The Finance (No. 2) Act, 1915, was considered by the Committee in connection with the liability of gas companies to pay excess profits duty; and although it was felt that gas companies might be liable to pay the duty, a representation was addressed to the Commissioners of Inland Revenue pointing out the hardship which would fall upon sliding-scale companies whose receipts were increased owing to increased price of gas, but whose dividends were correspondingly reduced.

The Committee have watched the progress of the Gas (Standard of Calorific Power) Act through Parliament. The Committee consider this measure, which enables gas companies to substitute a calorific power standard for the present illuminating power standard, by an inexpensive application to the Board of Trade, to be of great advantage to the gas industry.

The Committee have given close attention to the proposed formation of a National Gas Council in conjunction with the Institution of Gas Engineers, the British Commercial Gas Association, and the Society of British Gas Industries. Various meetings of the bodies concerned have been held, which have been attended by the Committee, at which resolutions connected with the proposed National Gas Council have been considered, and a further meeting took place on Oct. 3, at which the constitution of the National Gas Council was arranged.

The following are the principal matters upon which the Secretary has been consulted during the past year: Numerous questions relating to the Price of Coal (Limitation) Act, 1915. As to sale of coke—Shops Act, 1912.

As to liability of gas company to raise gas apparatus where local authority raises road level. Allowance to secretary on war service. Questions *re* income-tax. Suspension of sliding-scale. Statutory Companies (Redeemable Stock) Act, 1915. Mode of charging by electricity company to displace use of gas. Pooling of railway waggons. As to mode of assessing gas-works for rateable purposes. Liability of gas companies to pay excess profits duty. As to inclusion of gas companies in Factory and Workshops Acts. Right of gas companies to invest in increased reserve fund reduced by depreciation. Charges for street lighting in war time. As to gas company's liability for consequences following reduced pressure pursuant to provisions of Defence of Realm Act. Subscription to Association as trading expense. Gas company's right to compensation for loss of gas occasioned by sewerage operations. As to liability for damage to goods in transit. As to advantages of Gas (Standard of Calorific Power) Act, 1916. Form of geyser hire agreement. Income-tax authorities claim for income-tax on revenue expended for capital purposes. As to light standard for testing illuminating power.

The total number of members of the Association is 138; one company having joined, and one member having withdrawn from, the Association during the year.

The following members of the Committee retire in accordance with Rule 9: Mr. R. B. Anderson (City of Waterford Gas Company). Mr. W. Belton (Shrewsbury Gas Light Company). Mr. Thomas May (Richmond Gas Company). Mr. S. Y. Shoubridge (South Suburban Gas Company). Mr. Hanbury Thomas (Sheffield United Gas Light Company). Mr. D. Milne Watson (Gas Light and Coke Company). All offer themselves for re-election.

Not a Busy Year.

The Chairman, in moving the adoption of the report and accounts, said they had not had a very heroic year. The long list of questions that had been under the consideration of the Committee and the Secretary did not contain anything at all comparable with those classic fights over the residuals clauses and the standard burner, or with the great victory achieved in relation to the powers of charge for electric supply. But they had, towards the end of the report, a paragraph which would, he had no doubt, meet with the general approval of the members. At any rate, it constituted a very important step and alteration in the condition of things for the gas industry. Running through the earlier part of the report, it would be seen that they had converted the old funds of the Association into new War Loan; and they had raised a loan from their bankers, which was necessary to carry out the operation. The amount of the loan had been reduced by £600 during the year, which would be regarded as satisfactory.

The War and the Sliding-Scale.

The Committee had had various proposals made to them with regard to dealing with the sliding-scale. They came from special cases, which, in fact, were so special that it would have been idle to consider pursuing them. It was quite certain that, altered as their conditions had been by coal and the wages question, any dealing with this matter of the sliding-scale must be upon a general footing, if it was to be carried to a success. Possibly the bases of the sliding-scale system—with wages at the old rates, and coal at a price a little over half what it was to-day—might prove, if the war lasted longer, and if the exhaustion went on as it had been going on, to be bases which they would not propose to-day, and which they would not propose to continne under. But this was a matter that must lie in the womb of the future. When it was shown that there existed a general complaint that must be dealt with, the members would find that the Committee of the Association would do everything in their power to further the establishing of the matter upon an equitable and just foundation.

Coal Position and Excess Profits.

The Committee had been busy during the year on two important subjects. First of all, in connection with the Insurance Act, they had co-operated with the Institution of Gas Engineers in the settlement of further questions as to the classes of workmen in the gas industry who were to be brought into the various grades of insurance. But they had been particularly engaged, and very wisely and often engaged, on the great question of promoting, as far as they could, improvements in connection with the price and supplies of coal. He was sure Mr. Milne Watson and himself had all but worn out the carpets at the Board of Trade office. [Laughter.] At all events, Mr. Watson had pretty well lived there for some time; and he (Mr. Jones) had not been an infrequent visitor. He was bound to say that he thought the way the position had been so often put by Mr. Watson, by Mr. Charles Carpenter, by Mr. Alderman Phillips, of Salford, by the Convener of the Glasgow Corporation Gas Committee, and by Mr. Alexander Wilson had been most effective; and they had carried weight and conviction where they had been heard. So far, he thought they might congratulate themselves that the price of coal had not gone quite out of sight. But, for those living on the Continent, it had gone out of sight, or, at any rate, there was not in it anything like a profit-earning position from gas. The cost of coal would also reduce the profits of the gas companies in England. In this connection, it was rather curious that the Commissioners of Inland Revenue should now be discussing with them the question of excess profits. As an old gas manager, he could hardly conceive where on earth any excess profits were to come from. If any of them had been so unwise as to increase the price of gas beyond anything necessary to pay the coal bill, he could only congratulate them upon their courage and exceptional position.

The National Gas Council.

Coming to the important matter which was referred to in almost the last paragraph of the report, the report said that the Committee had given close attention to the proposed formation of a National Gas Council, in conjunction with the Institution of Gas Engineers, the British Commercial Gas Association, and the Society of British Gas Industries. Various meetings of the bodies concerned had been held, which had been attended by the Committee, at which resolutions connected with the proposed National Gas Council had been considered. A further meeting took place on Oct. 3, at which the constitution of the National Gas Council was arranged. He should like Mr. Milne Watson—who really had been the *deus ex machina* in bringing about this confederation, because he had studied the whole subject very keenly, and had made it quite his own—to explain the position. He (the Chairman) did not mind telling the members that Mr. Milne Watson convinced the Committee to a man—to a unanimous conclusion—that the time had come when the Association must extend its purview beyond mere legal and parliamentary questions. He (the Chairman) had told the members they had been worrying the Board of Trade over coal. He had told them of the other matters they had been watching and looking after—such as the question of the addition to wages, which payments under the Insurance Act really constituted. These were not merely legal or parliamentary considerations such as they had been chiefly limited to in the past; and he thought the Committee were thoroughly convinced that the Association must definitely extend its "protection" to matters other than legal and parliamentary. Then came the question how they should get help and financial strength, and how they should obtain support and weight with the authorities and others unless they did (as it were) confederate with the other bodies. Then there was the fact that many of the points which they looked after with great anxiety were subjects which also arose with the same urgency and the same pressure upon the gas undertakings belonging to the municipalities of the country. Although in the Association there appeared to have been some fear that their interests might clash, really, when they looked into the matter carefully, they found that the interests of the municipalities, *quâ* gas, were the interests of the companies, and upon essentially gas questions were practically identical. Had there been more time, the Committee would have put before the members that day a resolution—they hoped to bring it forward at some future date—enabling the Association to include in its membership gas undertakings other than those belonging to companies. However, to use a vivid expression of Mr. Milne Watson, a great many people in the country had considered they must have "a live wire"—a more influential current, a more widely known current, than was furnished by the Association. Therefore, it became incumbent upon them that they should unite with the other three Associations; and the Committee had come to the unanimous conclusion that they should. They met the representatives of the other Associations; and the constitution of the new body was practically agreed upon. He should like Mr. Milne Watson to tell the members, as they were entitled to know, how far it had been settled. He did not think the members would consider the Committee had gone any too far in this, and felt sure that they would approve of the step taken, and would back-up and support the Committee.

Value of the Association and Non-Adherent Companies.

Before he sat down, he must point out that the number of members of the Association was not greater than a year ago. They had lost one member, and had gained one. He was afraid that throughout the country generally the exact position of the Association and its value were not understood. A great many companies evidently did not read the papers, and so did not see what was going on; and that such matters as chemical restrictions, standard burner, and the Long Eaton electric charges illegalities had been dealt with. He was sorry they had missed these things, because he was perfectly sure that if gas companies generally were aware of them, every one of them would come into the Association. With regard to the Committee, the retiring members were all willing to serve the Association again; and he hoped they would receive the support of, and re-election by, the members. He should include their re-election in the motion adopting the report.

Explanations Regarding the National Gas Council.

Mr. D. Milne Watson said he had not come prepared to make a statement; but, as Mr. Jones had asked him to do so, he would do his best to explain in few words the position with regard to the relationship between the Association and the National Gas Council. Before doing so, however, he should like to second the motion for the adoption of the report. He did not know that he was entirely in order in seconding it, as he found his own name among those members of the Committee who were up for re-election. But leaving his own name out of consideration, he supported the resolution. The Association had considered the question of joining the National Gas Council, and had given earnest attention to the question, as they regarded it as a very important departure. It was in the first instance undoubtedly felt by some that, departing from its old traditions, the Association would be giving up a certain amount of freedom, and it might involve it in difficulties. But after carefully thinking over the question, it was felt that it was not so. To have stood aside at the present time would have been to neglect a great opportunity of strengthening the gas industry. The Association had in the past, as they all knew, dealt with the more legal side of the gas industry's business. This, of course, was of the utmost importance in the new Association. To have stood out would have been, he considered, a mistake in policy; it would have weakened the National Gas Council, and would have weakened the position of the Association. This would have been a most unfortunate result. After due consideration, they as a Committee decided—he was glad to say unanimously—to join the movement, and become one of the four bodies to constitute the National Gas Council. The Council consisted of the Institution of Gas Engineers, the British Commercial Gas Association, the Gas Companies' Protection Association, and the Society of British Gas Industries. The governing bodies of these four organizations formed the Council of the new body—that was, the General Council. Then a Committee had been appointed, called the Consultative Committee, consisting of nine members of each of the four bodies. This Committee, he took it (the matter was not settled yet), would deal with questions of general policy. Then there had been a further cutting-down to twelve members (which had been commented upon a good deal in various quarters), who would form the Executive Committee, and would, he took it, be the body which would be the acting and probably originating spirit in any movements. This body had power to co-opt, for special purposes, members of the other bodies or any other individuals. But it was too early yet to say exactly what might happen, inasmuch as a small Committee appointed had not yet met to decide the question as to how the business of the National Gas Council should be carried out. At any rate, these were the bare outlines of the new creation. He, for his part, thought that a very good body had been formed; and if it set to

work properly, and there was a certain amount of give and take, he was quite sure that it ought to do good work. There had been a want of such a body for some time when questions had come up before the Board of Trade or the Ministry of Munitions. In the past, various gas undertakings' representatives had grouped themselves together—perhaps from London, perhaps from the Midlands or the Manchester district, perhaps from Scotland—and had approached the Board of Trade, the Ministry of Munitions, or other bodies. They had been asked whether they represented the industry as a whole, or only London, the Midlands, the Manchester district, Scotland, or the West of England. Government departments did not want to deal with the industry sectionally. They wanted to deal with the whole industry, so that any decision would apply to the entire industry, and not to any section of it. Cases had arisen where these groups had gone to see Government departments, and had made certain arrangements; and then another body of gas undertakings had had to come and undo the work the others had done. This showed the necessity of one body. Now there would be no possible excuse for overlapping. The work of the National Gas Council, he took it, would be to select, when any question arose, the best possible men on the particular subject to go to the Government departments in question. If it were a matter of coal or oil, illuminating power or sliding-scale, the National Gas Council would know who were (so to speak) the experts on the subject, and would select these men to put the case before the Government authority. This would be a great gain. He had made a somewhat long statement; but he thought it as well as he had the opportuity of explaining the position. The Association had not sunk its personality; and, as the legal and parliamentary element in the National Gas Council, it would be able to do more useful work in the future than it had done in the past. He would also like to mention that their Chairman (Mr. Jones) had been elected the first President of the National Gas Council. [Applause.]

The CHAIRMAN said he should like to add that the Association had been so constantly called upon to act in concert with the Institution of Gas Engineers on many questions, and had even been asked by the Commissioners of Inland Revenue to assist with the Institution in the settlement of the depreciation question, as well as being associated in dealing with labour, coal, and other matters, that this uniting of their interests was, in his opinion, a very proper proceeding.

THE COMMITTEE AND THE SLIDING-SCALE QUESTION.

Mr. H. E. BLOOR (York) said he desired to refer to two points. In the first place, he had a suggestion to make with reference to the constitution of the Committee. The present system was that, as the members of the Committee retired annually, they were eligible for re-election. This, as it were, on the one hand, stereotyped the Committee, except in so far as members of the Committee retired through special reasons or by death; while, on the other hand, it possibly did cause the Committee to consist of members representing the largest and most influential companies. He ventured to suggest that the Association should come into closer association with its members. It would, in his opinion, benefit and strengthen the Association if some system of retirement by rotation were established, and other members were allowed to flow through the Committee. He merely made this suggestion, and he ventured to say that it was one worthy of consideration. Under the present system, it might be argued, there was nothing to prevent any member from proposing the election of any gentleman. But this immediately introduced a competitive element into the proceedings, of which they would not approve. The other matter upon which he would like to remark was the question of the sliding-scale. This had been referred to by the Chairman; and he was very gratified indeed to note that the matter still remained one for consideration, and that if, in the opinion of the Committee, the circumstances at some future time justified the reopening of the matter, they intended to reopen it. He wished, however, to refer at a little more length to what had actually happened on the sliding-scale question. The matter was raised by his Company [York] in a letter dated Oct. 27, 1915, and signed by the Chairman of his Company, in which a fairly complete argument, so far as his Company was concerned, was set out. It was pointed out that the Company were in a special position in that they had only recently—1912—come under the operation of the sliding-scale. In this respect, they were very different from a Company who (say) in the early Seventies obtained the sliding-scale with a large margin of pence over which to reduce the price of gas. Such companies had had the benefit of the sliding-scale for a long term of years. He quite admitted that there was no room for argument about it, that the position of his Company was quite special. In addition to his Company, the Preston and the South Shields Companies raised the matter at a later date, and the communications were, he believed, considered at the same time by the Committee. He wished, however, to draw attention to the particular matter of his own case, and the manner in which the application was dealt with. The letter, as he had said, was written in October, 1915; and a reply was received from the Secretary to the effect that he had consulted with the Chairman, and that, in the Chairman's opinion, nothing could be done in the matter. He must admit that his Directors, as well as himself, felt they had some grievance in this—that the matter was one so obviously important that it warranted very thorough consideration by the Committee, and that (as it were) judgment upon it should not, without thought, have been expressed at such an early date, before the whole Committee had had an opportunity of considering it. A particularly unfortunate aspect of the matter was that (as it were) the Chairman's own action in the matter was fixed and announced before the Committee in general had considered the question. The Association justly placed the greatest confidence in its Chairman; and the Committee, who had had (through the circumstance he had already mentioned) long association with him, were also justified in placing the greatest confidence in the Chairman. But from the point of view of the provincial member raising a very important and controversial subject, there did appear to him to be a little ground for complaint. Now, at a later date, the applications from the three Companies were considered by the Committee, and the prior expression of opinion by the Chairman received the assent of the Committee. He might almost have said "needless to say." He did not know how thorough the discussion was on that occasion; but he should like to be able to think that, before such an important subject was considered, the correspondence relative to the matter was typed and circulated to all the members of the Committee, and that a special meeting was held to consider a matter which involved such deep and profound questions. It appeared quite probable, so far as they could see at present, that in the future an entire revision of the value of money would take place. It seemed clear that one way of paying for the war, and reducing the burden of the war, might be that the value of the sovereign—the unit—would be reduced very materially, and therefore that the payment of the interest on the national debt would in effect be reduced in this way. If he was right, the whole relation of the sliding-scale to gas companies' circumstances would be permanently altered. It would mean that wages would occupy a permanently higher position. Some people had asked would they ever be able to take off the war bonus. The answer might be "No." If it were not directly taken off, he suggested it would be in another way—through the money continuing to have only the purchasing power that it had now with the increased cost of living. All this meant that matters relating to the sliding-scale would be permanently shifted; and it showed how difficult the whole question was. It seemed to his Directors and himself that the time—the psychological moment—at which to have raised the matter of the sliding-scale was when the (so to speak) centre of gravity had been at any rate temporarily shifted. However, when the matter was considered by the Committee a reply came enclosing a resolution passed by them, which he considered it would be a calamity to gas companies to have published, as being the expression of the opinion of a Committee established for the "protection" of gas companies. It was rather the manner in which the matter was dealt with than the fact that the Committee did not take action at the time of which he complained. He suggested that it would have been better to have had a Special Committee, and to have asked the representatives of the gas companies who had opened the question to appear before the Committee, and give their views; and then if it was felt that, for reasons of high policy, the time was not ripe for taking action, the decision could have been arrived at without giving offence. He wished to propose that the paragraph referring to the matter in the annual report be referred back, and that the Committee be asked to give the matter further attention.

The CHAIRMAN said that this would practically be a vote of want of confidence in the Committee. He might answer Mr. Bloor's observations at once. It appeared to him that an unfortunate reply was sent to him in the first instance. The fact was the Secretary come to him, and he (the Chairman) said: "I really do not see how the Committee can rectify a bad bargain that any particular company has made." The speaker had pointed out that the companies who took the sliding-scale at any early date got very liberal terms. They were pioneers; and they obtained the reward of pioneers. If bad terms were obtained by the York Company in recent legislation, it was the result of a long parliamentary inquiry; and it would have been hopeless to have taken up the cudgels for York specially. Mr. Oke, it would be remembered, came and complained at their last meeting that the Committee would not spend money over the rich Southampton Gas Company, who had, in a certain matter, failed before the Board of Trade and then the House of Commons, though they were successful ultimately in the House of Lords, and then got something back. The Association could not exist to defend anything but general interests. A matter must have general importance and interest for the Association, with its slender funds, to take it up. The resolution to which Mr. Bloor referred did not emanate from the Chairman. The speaker seemed to think that everything was done because the Chairman expressed an early opinion that there was nothing that could be effective. The Chairman never offered the slightest opposition when the matter came up for general discussion; but he might say that he did approve of the resolution in full. They could not act on the Committee as though they were spoiling for a fight on every possible individual case in which there was something of which to complain, or some little hardship; but the matters must be considered that had some permanence. Mr. Bloor had spoken about the value of money and so-forth. Directly the situation changed materially—when, for instance, wages, coal, and money were permanently different—then they would have a general case upon which the Committee might go before Parliament. With regard to the constitution of the Committee, although perhaps it might be a little more frequently refreshed, he thought, as an old county councillor, and an old member of Quarter Sessions, that those gentlemen who had been long enough in their positions to learn their business, and knew what they were about, were of more value than strangers. But reverting to the sliding-scale, the position was this, that it was quite hopeless to hang-up the sliding-scale at a particular juncture in the manner that had been suggested; and the advice that a company with any particular grievance should apply to the Board of Trade was the only possible answer that could be received from any body of men who gave fair and equitable consideration to the question. In their Committee over this particular matter, Mr. Bloor wished the meeting to express their want of confidence.

Mr. BLOOR said he altogether objected to this description of his suggestion. But he did think the circumstances had now sufficiently changed to justify reconsideration of the matter.

The CHAIRMAN said he would repeat that, when the matter became of general importance, the Committee would take it up again without the slightest misgivings or doubt.

Mr. SAMUEL TAGG (Preston) said he rose to support what Mr. Bloor had said, though he was not prepared to second his proposal to refer the matter back in face of the view the Chairman had taken of it, because this was not a question on which to take a vote of want of confidence. He would suggest that there was an alternative course. The Chairman said that the Committee felt it was inadvisable to raise the general question of the sliding-scale; but the continued depreciation of the capital invested in gas companies was of such vital importance that the Committee should take concerted action in any directions possible. His suggestion was that a large number of undertakings were now certified under the Munitions of War Act, 1916; and any labour question that arose was referred to arbitration. His own Company recently had the question arbitrated on. He (Mr. Tagg) made the point and he asked the Arbitrator to make a note of it, that the Com-

pany were lately before the Board of Trade for a Provisional Order, and their standard price was then reduced by 6d.

The CHAIRMAN: Your standard price?

Mr. TAGG said they had a neutral zone; and the maximum price was reduced by 6d. They had a neutral zone and maximum and minimum price. The neutral zone was abolished; and a standard price was fixed without it. When the arbitration regarding labour was held, he asked the arbitrator to make a note of the point that, if they placed a further burden upon the Company, which would necessitate an additional advance in the price of gas, by so doing, there would be an increased reduction in the dividends payable, and, therefore, if they put the further obligation upon them, relief should be given by altering the sliding-scale. If at any time it was necessary for the industry to take concerted action—and he was disposed to agree with Mr. Bloor that now was the time representations should be made—there was a growing volume of evidence and opinion in existence now, through the accumulation of isolated cases, which might influence the Board of Trade. He thought the matter was of such importance that, without referring back the clause in the report, he would associate himself with Mr. Bloor in wishing that the Committee would give careful consideration to the point during the current year.

Mr. BLOOR said he would withdraw his motion for referring back the clause of the report alluding to the sliding-scale. He quite agreed with what his friend had said.

The CHAIRMAN complimented both speakers upon the moderate manner in which they had brought this matter before the meeting. Mr. Tagg had done an extremely wise thing in calling the attention of the arbitrator to the fact that he would, by doing a certain thing, be disturbing the conditions on which the Company got their sliding-scale. The Company would now be able to state at any time that they put their protest on record, and this would be of assistance to them. This was a totally different thing from the Association going as a body for an alteration or suspension of the sliding-scale. There were a great many companies who would not listen to any suggestion that their standard price should be interfered with, although undergoing hardships at the present time.

Mr. R. W. EDWARDS remarked that the Committee were unanimously in sympathy with the York Gas Company. It was felt that the Company had made an extremely bad parliamentary bargain; but that was not sufficient for the Committee to go upon. They realized, too, that some undertakings were suffering more than others; and it was a very difficult thing to arrive at any general principle. The Committee therefore came to the conclusion that if any company thought they had made a bad bargain, as the York Company had done, as well as some others, and they felt they had a grievance, it would be much better for them to deal with their cases individually through their own applications. It had not been mentioned that at the present moment, when the price of gas had been increased, the consumer was now in the position of supplying (say) 16s. 8d. out of every pound, instead of the reverse when the price of gas had been reduced. And he did not think this would justify them going forward and attacking the principle of the sliding-scale.

Mr. F. W. CROSS remarked that in recent Electric Lighting Acts and Orders, the Northumberland clause had been inserted; but in the earlier Acts and Orders there was no such thing. Losses were being made, and the rates were drawn upon; and gas companies had to pay their share of these losses. This was a matter to which the attention of the Committee might be drawn.

The CHAIRMAN said they would consider it.

The motion was unanimously carried.

This concluded the business on the *agenda*.

ILFORD AND THE CALORIFIC STANDARD.

At the last meeting of the Ilford Urban District Council, the Clerk reported that, in accordance with instructions, objections had been lodged with the Board of Trade against the granting of the proposed Order under the Gas (Standard of Calorific Power) Act, 1916, on the application of the Ilford Gas Company, in the absence of the following conditions: (1) The imposition of a minimum pressure standard of 12-10ths of an inch water, instead of the present pressure. (2) The imposition of 540 B.Th.U. total heat, with a penal point of 500 B.Th.U., as the calorific power. (3) The apparatus to be used for calorific testing to be that mutually agreed by the Council and the Company, such apparatus to be capable of yielding, and to be used so as to yield, the total heat value of the gas in B.Th.U.

A subsequent communication from the Company's solicitors (Messrs. Torr, Durnford, and Co.) stated that the Company had had under consideration these objections and had instructed them to make the following observations upon the conditions which the Council suggest should be made: (1) With regard to a minimum pressure of 12-10ths of an inch, the Company submit that no good reason can be adduced in favour of altering the prescribed pressure in consequence of making the Order applied for. (2) That the calorific standard ought to be 500 B.Th.U. gross, in accordance with the definition contained in the Plymouth and Stonehouse Gas Act, 1916, and other recent precedents. (3) That the apparatus for testing should be that approved from time to time by the Metropolitan Gas Referees, and that no advantage is to be gained by authorizing the Company and the Council to agree upon any other method of testing.

The Clerk also reported the result of an interview with an official of the Board of Trade as to the objections made by the Council, and that the Board had under consideration the question of making their Orders under the Act subject to review within a reasonable time after the end of the war.

Messrs. A. & W. Richards, of No. 3 7, Walbrook, E.C., are making a new issue by tender, on behalf of the Grays and Tilbury Gas Company, of 200 £10 "B" shares, ranking for a standard dividend of 7 per cent., equally with the Company's existing similar shares, now receiving £5 19s. per cent. Tenders are to be opened on Nov. 9; and the minimum price is £10 per share.

A CALORIFIC STANDARD INQUIRY.

The Sheffield United Gaslight Company's Application for a Provisional Order.

At the Board of Trade offices in London last Tuesday, before Mr. GARNHAM ROPER, an inquiry was held into the application of the Sheffield United Gaslight Company for a Provisional Order under the Calorific Power Standard Act.

Mr. TALBOT, K.C., appeared on behalf of the Gas Company; Mr. HONORATUS LLOYD, K.C., and Mr. W. J. JEEVES for the Sheffield Corporation; Mr. DIXON DAVIS for the Midland Railway Company; and Mr. W. CANNING for the Great Central Railway Company.

Mr. TALBOT, who opened the proceedings on behalf of the Gas Company, after mentioning that the Company had, in accordance with the provisions of the Act, erected benzol and toluol recovery plant, and that they now applied for a calorific standard test, said that up to 1910 the Company were compelled by Act of Parliament to supply gas of an illuminating power of 16½ candles; but in 1910 there was a reduction to 15 candles. With the abstraction of the benzol for the use of the Government, however, it was impossible now to keep up to the standard of 15 candles; and in common with the great majority of undertakings, the Company had been compelled to reduce their illuminating power below that which by law they were bound to keep up. The present application was opposed by three parties—namely, the Midland and Great Central Railway Companies and the Sheffield Corporation. With regard to the Midland Railway Company, they had asked the Board of Trade to insert in any Order now made that the pressure at which gas should be supplied should be not less than 15-10ths tested in the main. The Gas Company were prepared to agree to this; but now the Railway Companies apparently wanted more—viz., 20-10ths. The Great Central Railway Company, in the first instance, did not raise this question, but instead they raised the question of price.

Mr. CANNING said the attitude of his clients was one of general objection; but their principal point was pressure.

Mr. TALBOT said that this matter must entirely depend upon the evidence; and he hoped to satisfy the Inspector that 15-10ths, which was the figure at which gas was supplied in the vast majority of cases, was sufficient. Coming to the petition of the Sheffield Corporation, Counsel pointed out that while they agreed to the principle of the substitution of the calorific for the illuminating standard, they disagreed as to the particular calorific standard which was asked for—viz., 500 B.Th.U. After sketching the history of the calorific standard through the Parliamentary Private Bill sessions of 1914, 1915, and 1916, he pointed out that the uniform practice of Parliament had been to fix a standard practically equivalent to 500 B.Th.U., for the purpose of imposing a penalty. There were one or two exceptions; but in the vast majority of cases in which the candle power varied from 12 to 16, the calorific standard for penalty purposes had been fixed by Parliament at 500 B.Th.U. Ossett and Doncaster—both Corporations in the neighbourhood of Sheffield—supplied 16-candle power gas, and at Dewsbury it was 14-candle power. In all these cases a calorific standard of 522½ B.Th.U. had been granted for penalty purposes. Leeds and Birmingham were now applying for the same standard as Sheffield. The Corporation case really was that they did not object to the substitution of the calorific test if this did not involve a reduction in the quality of the gas supplied to the consumers. The answer to this was that there is no exact ratio between illuminating power and calorific value, although he did not deny that the probable effect of the Order asked for, if it were made, would be to involve some reduction in what might be called the direct illuminating power of the gas—*i.e.*, it would probably enable the Company to supply a gas which would not pass the 15-candle power test in the Metropolitan No. 2 burner. Nevertheless, it was a trifling change at the most, and would leave the gas of a candle power substantially above that which was specified for the vast majority of gas undertakings in this country—namely, the 14-candle power test in the No. 2 burner. While he did not wish to convey to the Inspector the impression that there had been no complaints with regard to the gas supplied by the Sheffield Company in normal times—there were always complaints of one sort or another—there had undoubtedly since the war started been a heavy flood of complaints due to the reason that, partly owing to the abstraction of benzol and partly owing to the depletion of the staff, the Company had been less able to deal with such matters, and had been obliged to do less in regard to looking after their consumers' fittings than was the case before the war. There had also been trouble with the deposit of naphthalene in the pipes. This, of course, did not affect the quality of the gas in the technical sense; but it did affect the gas which the consumer had to burn. Apart from this, and in spite of what the Corporation in 1910 claimed to be the very large reduction from 16½ to 15 candles, there had been no complaints on the part of the consumers; and the result had been, prior to the war, as had been expected—namely, that the consumer got a gas sufficiently good, and he had obtained it cheaper. The Company's point was that the proposal now made to the Board of Trade was an economical one in the consumers' interest, and it was not believed that the Corporation, in opposing the calorific standard proposed, represented any actual feeling on the part of the consumers. They were taking what he ventured to think was a theoretical and an unreal obection. Another point in the Corporation's petition was the hardship which would fall upon the user of the flat-flame burner. But this was a very familiar one now; and it was common in all cases, where even reductions of candle power were granted, for a clause to be inserted in the Order compelling the undertakers to supply, at any time within two years, suitable burners gratis for those then in use. Although this period had now expired under the Company's Order of 1910, they were still willing to have it repeated, with necessary modifications, in the present Order if thought fit. At the same time, as a matter of interest, only 386 consumers out of a total of nearly 100,000 took advantage of the opportunity in 1910; and the Corporation, who in 1910 themselves used a great many flat-flame burners, did not think

it necessary to apply. The Company were willing now to give the best flat-flame burner available, and fix it for nothing. The next point raised by the Corporation was that as the Company had access to an excellent coal in the South Yorkshire coalfields they should have no difficulty in supplying gas of the present illuminating power by means of that coal. The Company did not in the least dispute that they could supply 15-candle gas; and it was possible that bye-and-bye, or even now, this could be done with sufficient enrichment. The point was that it was uneconomical and contrary to the interests of the consumer that they should be obliged to use the best coal when other coal could be supplied. Then the Corporation dwelt upon the inferiority of the quality of the gas, both for heating and power. The Company, of course, had considered this, and all that could be said was that it would be madness on their part to supply gas which the large consumers did not want; and their records in the past of the enormous development of gas supplied in Sheffield showed that, in fact, they had been successful in supplying consumers with the kind they wanted, and in keeping them satisfied with it. What was now required was to supply the consumers more cheaply.

Mr. *Hanbury Thomas*, the Managing Director of the Sheffield United Gaslight Company, said that when he went to Sheffield thirty-four years ago the price of gas was 2s. 4d. per 1000 cubic feet. It subsequently reached 2s. 9d.; but that was the highest price. The year before the war the average price was 1s. 1¾d. This was the result of the Company making use of every possible economy; and in this way the gas consumers of Sheffield had been saved hundreds of thousands of pounds. None of the savings had gone to the shareholders, because a level dividend of 10 per cent. had been paid ever since the price was 2s. 4d. In other words, the shareholders had no hope for anything in the way of increased dividends from any reductions in price which might follow the granting of the Order, though, on the other hand, they had nothing to fear practically in the way of reduced dividends. In July, 1915, the price had to be raised by 6d. per 1000 cubic feet, so as to cover the cost of manufacture, owing to the increase in coal and labour charges. The proposal to supply gas of a value of 500 B.Th.U., instead of the present 14-candle power, would result in the gas still being about 14 candles. But as with the candle power, which the results of tests showed was always higher than the statutory limit, so with the calorific standard they would make it higher than the statutory limit—probably 530 or 540 B.Th.U. The Company started extracting benzol and toluol in August and September, 1915; but they did not get into full working order until later. With regard to the Railway Companies, they at first demanded 15-10ths pressure, and he was willing to concede that; but now they suggested that the Company should be under an obligation to supply 20-10ths. This, however, would be unreasonable, although at times of heavy consumption the Company even now frequently had 30-10ths, or even 33-10ths, pressure in the mains. As to the suggestion that the Company should confine themselves to the coal in the South Yorkshire field, witness said, even if it were the best in the kingdom, it was impossible to get it. The collieries that supplied this coal were very few in number; and year after year they would not supply the Company with more than they had been in the habit of supplying before. He had tried over and over again to get some of the collieries to supply more coal. As a result of the reduction of the illuminating power standard in 1910, there had been a very extensive development in gas supplied, especially for furnace purposes. The Company had laid themselves out particularly to supply furnaces. In 1911, which was the first year after the reduction in quality, the Company supplied eighty furnaces, with an approximate consumption per hour of 28,350 cubic feet; in 1912, there were 103 additional furnaces, with an approximate consumption of 28,210 cubic feet per hour (this lower consumption being because there were rather more furnaces, but probably of less size); in 1913, a further 98 furnaces were installed, with an approximate consumption of 42,115 cubic feet per hour; in 1914, an additional 90 furnaces were installed, with an approximate consumption of 69,750 cubic feet per hour; in 1915, another 144 furnaces were installed, with an approximate consumption of 96,985 cubic feet per hour, and up to date, in 1916, still another 133 furnaces, with an approximate consumption of 106,830 cubic feet, had been installed. These figures were merely to show that the reduction in 1910 had resulted in an enormous development in the supply and use of gas. During the same years, 15,166 additional horse power in gas-engines had been installed; and the consumption in cubic feet per consumer over the whole system worked out to the very high figure of over 46,000 per annum. Dealing with the question of the flat-flame burner, witness said that, in spite of the point made by the Corporation that there were many trades in Sheffield at which it was impossible to use incandescent burners by reason of dust and vibration, the difficulties were being got over, and in any case the Company were prepared to deal with any consumer, be he trade or private, on the basis of supplying new burners to burn the quality of gas which the new Order would permit. The naphthalene trouble already referred to was caused owing to the absence of the benzol, which in the ordinary way acted as a carrier and resulted in the naphthalene remaining to some extent in a gaseous form and being burned at the burner. This trouble had not been experienced for ten years prior to the war, but was now being dealt with in a large number of towns. The calorific value of the gas supplied during the last two or three years had been about 490 B.Th.U.

In cross-examination by Mr. HONORATUS LLOYD, witness agreed that during the war the Company had been really working to no standard for penalty purposes, but were, in the circumstances, doing the best they could. The question for determination was as to the conditions under which the Company should work when the war was over. He agreed that it might be necessary for the consumers to use slightly more gas to produce the same result, but could not say exactly what it would be. He certainly would not agree that, so far as furnaces were concerned, a man who to-day had four furnaces would have to put in five in the future to do the same business. The difference, if any, would be very small. The number of consumers using flat-flame burners was getting less and less every year. While the Company were not contemplating manufacturing gas by means of coke-ovens, they had been applied to to purchase coke-oven gas. If they did this, it would have to be enriched. At the same time, there were a certain number of large consumers in the big works at the east end of the town who would be willing to take the whole of this coke-oven gas of whatever quality it might be.

Mr. HONORATUS LLOYD suggested that it would be possible, if the Company did this, to supply coke-oven gas to all consumers whether the standard be 300 or 500 B.Th.U.

Witness replied that before the Company could supply coke-oven gas they would have to obtain parliamentary sanction. The offer, although it had been made, had not been accepted.

Mr. HONORATUS LLOYD finally put a few questions with the object of showing that the reason why the Company had agreed to 15-10ths pressure was because more gas would have to be used on the new standard; but witness contended that 15-10ths had been found to be the right pressure at which incandescent burners could burn well.

Mr. DICKSON DAVIS, cross-examining on the question of pressure, said that at the present time the Company supplied the Great Central Railway Company at considerably above this.

Witness replied that, whatever the pressure was at present, the Company had no intention of reducing it. It would not be fair when the Company had given their consumers all that they required in the past, to ask them now to put themselves under a special penalty clause in respect of a thing they had been doing.

Mr. CANNING, for the Midland Railway Company, cross-examined on the same point.

Witness, in re-examination, said that the idea suggested by Mr. Honoratus Lloyd that the Company were willing to increase the pressure because a worse gas would be supplied was a new one altogether. On the other hand, the Railway Companies' representatives seemed to suggest that the Company were going to reduce the pressure. As a matter of fact there would be no change whatever; and the Railway Company would continue to be supplied with gas at a pressure three or four times that of the legal obligation. If the Company came under an obligation to supply gas at 15-10ths at every part of the system, at every hour of the twenty-four, the Railway Companies would of necessity obtain a much higher pressure than the 15-10ths, as they did now.

Mr. *Harry E. Jones* expressed himself strongly in favour, in the interests of the consumer, of a calorific test of 500 B.Th.U. It was forced upon the Wandsworth Company in Parliament in 1912, and upon the South Suburban Gas Company in the same year. In both cases the minimum was 484 B.Th.U., while, in fact, the actual working figure had been from 510 or 515. It averaged about 525, although since the war it had been necessary to run a bit lower. With these figures there had been no complaints or difficulties from anybody, even from the users of flat-flame burners. Similarly, in the case of the Commercial Gas Company 500 B.Th.U. was the minimum; but the actual working figure varied from 520 down to about 495—the latter figure again being due to war conditions.

In answer to Mr. HONORATUS LLOYD, witness said that before the war the previous 14-candle power standard of the Wandsworth Company and of the Commercial Company was well maintained under the 500 B.Th.U. test.

Mr. DICKSON DAVIS and Mr. CANNING cross-examined on the question of pressure; but witness would not agree that anything more than 15-10ths was necessary. Owing to the hilly nature of Sheffield, it was necessary to keep up a very high pressure; but that the maximum should be compulsory at all hours of the night and day would be an unreasonable and extravagant proposition.

Professor *W. A. Bone*, Professor of Chemical Technology at the Imperial College of Science, London, said he attached great importance not merely for the purpose of the war, but generally, to the question of residual products. He was Chairman of the British Association Committee who were investigating fuel economy from a national standpoint. This Committee attached very great importance to the proper utilization of coal, and the recovery of all possible bye-products therefrom. For this reason he was a strong supporter of the substitution of the calorific for the illuminating power test. As to the standard, it really made very little difference from the point of view of furnace apparatus whether the standard of calorific value was fixed anywhere between 450 and 550 B.Th.U., provided that whatever the standard was it enabled the gas undertaking to give the consumer the largest number of heat units in the form of gas for a given cost. Supposing they were supplying a consumer one week with gas at 600 B.Th.U. and the next week at 500 B.Th.U., the consumer would have to buy more in proportion of the lower calorific gas. This could not be contested; but the *crux* of the point was that, by supplying him, for instance, with 500 B.Th.U. gas instead of 600 B.Th.U., the heat units were supplied to him at a lower cost. A gas undertaking would not only be justified in doing this, but would be very foolish if they did not do it.

Mr. HONORATUS LLOYD, addressing the Inspector on behalf of the Sheffield Corporation, said he did not propose in any way to cavil at the adoption of the calorific standard in preference to the illuminating power test. The calorific standard had now been accepted and adopted as the more preferable. The whole point here was whether or no, under the special circumstances at Sheffield, it was right that a minimum of 500 B.Th.U. should be fixed. He had not troubled to cross-examine Professor Bone, because he agreed with all that witness had said—namely, that it makes little or no difference whether the British thermal units were 450, 500, or even higher, provided that the largest number of heat units were provided in proportion to the money spent. This was the whole point; and his argument was that at least 550 B.Th.U. must be supplied in Sheffield in order to bring about the economy for the consumer of which the Gas Company spoke. Professor Bone had said that with a low calorific power as compared with a high one more gas must be used proportionately so as to achieve the same result; and this was all that he desired to put before the Inspector. As an economical question, it depended upon whether or no the generation of gas at a particular figure was or was not going to be economical. Supposing, as a matter of fact, that the Company were, by manufacturing gas to pass a standard of 500 B.Th.U., able to save (say) £10,000, but supposing also that the users of gas in Sheffield

had to buy so much more, which in the aggregate amounted to £15,000—clearly it would not be an economical problem. This, he ventured to suggest, would be the result of the Company's proposal in Sheffield. This principle applied right through, no matter the use to which the gas was put—the consumer would inevitably have to use more gas, and, consequently, pay more. With regard to the suggestion of Mr. Hanbury Thomas that he would require parliamentary powers before he could supply coke-oven gas, the fact was that these powers were not necessary. The Gas Company were under the obligation to supply gas; and if they chose to-morrow to supply any form of gas, it could be done. If, therefore, it was possible for the Company to supply 500 B.Th.U. with coke-oven gas, what became of the flat-flame consumer? because coke-oven gas in a flat-flame burner was practically non-luminous. All the Corporation wanted was the same quality of gas that they had before the war; and this he would prove was represented by 550 B.Th.U. Otherwise the Company should remain as they were at present—upon an illuminating standard. Nevertheless, he did not recommend the latter, appreciating as he did that the calorific standard was the better.

Alderman *Robert Styring*, the Chairman of the Sheffield Corporation Committee who deal with the gas undertaking, said there had been very general complaints as to the quality of the gas supplied and as to the increase in consumers' gas accounts. Recognizing that this was due to some extent, at any rate, to the war, no objection had been raised to the position. So long as the war continued, they desired to do everything possible to facilitate the operations of those who had charge of it. With regard, however, to the substitution of the calorific power standard for the illuminating power test after the war, so long as this was merely a change of measuring capacity there was no objection. But it was considered distinctly unfair that the Company should endeavour to take advantage of the present abnormal conditions to stereotype a new state of circumstances with regard to the standard. The Corporation would very much have preferred for the whole position to have been left over until after the war. However, the Company had made their application, and the Corporation were advised that the new standard would have the effect of reducing the power of the gas to about 12 candles. The suggestion that the consumers would be content to use a larger quantity of inferior gas to get the same result was entirely without foundation. The Corporation were of the opinion that there was no public demand for a supply of this lower grade of gas, and that there was no necessity at all for the application by the Company. At the same time, the Corporation were prepared to agree to the change to the calorific standard now if the standard was made 550 to 560 B.Th.U.

Mr. TALBOT's cross-examination took the line of pointing out the manner in which the Sheffield Gas Company had kept the price down to practically the lowest in the country—a policy which had all been in favour of the consumer.

Witness, in re-examination, however, said that the Company had a very low capital expenditure brought about by the fact that the works had been largely built out of the profits from the consumers.

Mr. *F. Wardley*, the Secretary of the Sheffield Cutlery Union, spoke of the difficulties of using incandescent burners in many of the processes in the trade, owing to the fact that the nature of them precluded any windows in order that there should be a free current of air. Consequently, the flat-flame burner was the only one which could be used. If the new standard proposed by the Gas Company involved a change in the quality of the gas, and new burners were fitted by the Gas Company, it would be a case for the employers to consider whether it was as economical as at present.

Mr. *W. Cook*, the Secretary of the Spring Knife Workers Amalgamation, and a grinder by trade, spoke of similar conditions in his industry, and objected to anything being done by the Gas Company which would increase the cost of lighting by flat-flame burners.

Mr. *Isaac Carr*, the Engineer of the Widnes gas undertaking, said the equivalent calorific value of a 15-candle-power gas was about 560 B.Th.U. A 500 B.Th.U. gas would involve a reduction of about 3-candle power. Such a reduction would mean a distinct increase in cost to the consumer. If the Sheffield proposal was carried out, 50 per cent. more gas would have to be used in the flat-flame burner to get the same amount of light as at present; and the price would be equivalent to 2s. per 1000 cubic feet instead of 1s. 3d., the pre-war price. For heating, cooking, and power he calculated the increased cost would amount to 1·43d. per 1000 cubic feet. On the other hand, the saving to the Company would not be equivalent to the extra cost put upon the consumer, and certainly it was not a sane policy from the consumers' point of view. The average calorific value of the gas at Widnes at present was 570 B.Th.U.

In cross-examination, witness maintained that calorific power and illuminating power rise and fall in a definite ratio. In qualities of 12 to 16 candles, it was about 2½ to 3 per cent. per candle, and he had known it to be as much as 4 per cent. The economy to the Company from the proposed change he put at £30,000, and the additional cost to the Sheffield consumers at £65,000, on the assumption that one-fourth of the gas was used in flat-flame burners.

This led Mr. TALBOT to suggest that, as the Company would get all this extra revenue, and could not increase their dividends, the inevitable result would be a reduction in price.

Witness replied he did not know what the Company would do with the money.

In answer to the INSPECTOR, witness said that 500 B.Th.U. as a standard was too low for any town. The present actual calorific value of the gas in Sheffield was 560 B.Th.U.

Mr. TALBOT: That is theory.

Witness said it was obtained from a test of coal gas made in a similar way.

Mr. TALBOT: We have given no evidence on this because we do not know.

Mr. DIXON DAVIS, for the two Railway Companies, at this point said that they valued the good relations that had existed between them and the Gas Company for many years; and having had a consultation with Counsel, he would not need to take any further part in the proceedings.

Professor *F. W. Burstall* confirmed Mr. Carr's views that while not objecting to the calorific standard in principle, it was necessary, in making the change, to fix an adequate figure. Taking the special circumstances of Sheffield into account, he regarded 550 B.Th.U. as a reasonable standard.

In reply to Mr. TALBOT witness said he had not gone into the question of the cost of supplying gas at 550 B.Th.U. *plus* the necessary margin to enable this figure to be maintained as a minimum. He admitted that only the flat-flame burner user would be prejudiced by the low standard.

Mr. TALBOT then addressed the Inspector, and emphasized the point that if the consumers paid more in Sheffield, every penny must go back to them in reductions in price, as the Company could not increase their dividends. It was really only a question of the flat-flame burner, notwithstanding all that had been said as to the effect upon the Sheffield industries. Yet the evidence showed what a small and diminishing proportion of the whole the flat-flame user was; and the Company were willing to come under the same obligation as regards him that they did in 1910.

The INSPECTOR said the whole discussion had been upon the proper line at which to draw the penalty limit. Would it meet the views of the parties if the Order enabled either the Company or the Corporation to apply to the Board of Trade after a certain period to reduce or increase the standard?

Mr. JEEVES, for the Corporation, could not agree to a low standard being fixed now, and such a provision as suggested. It was regarded as very essential in the interests of Sheffield that the figure should not be below 550; and there might be provision for the Company to apply at a later period. There was no objection to going down to 500 B.Th.U. during the war, or for three months afterwards; or if the Order legalized what was being done now, there would be no objection.

The INSPECTOR pointed out that the Board of Trade could not create precedents, and Parliament had not yet placed the limit at the figure of 550 B.Th.U.

Mr. JEEVES said the nearest was Liverpool, with 522½ B.Th.U. But the Inspector had to deal with special circumstances here.

The INSPECTOR said he felt that 500 did not mean finality in this matter, even in Parliament. It was a comparatively new thing in the last three or four years, and it was quite possible that Parliament might pass a General Act that it should be higher or lower.

The decision will be announced in due course.

SOUTHEND TOWN COUNCIL AND THE GAS COMPANY.

An Official Reply to the Committee of Inquiry.

There was noticed in last week's issue of the "JOURNAL" [p. 191] a report by a Special Committee of the Southend Town Council appointed to consider the possibility of effecting a reduction in the price of gas in the portion of the borough which is within the Southend Gas Company's area of supply. The Secretary of the Company (Mr. J. T. Randall), it may now be added, has forwarded to the local Press the following reply to the Committee's statements:

"No inquiry was made of the Company; and the value of the report of this Committee may be indicated by this extract: 'They have paid, both immediately before and since the alteration of price, dividends at the rates of 5½ and 5¾ per cent. respectively.' The fact is that the dividends paid since the alteration in price were 5 and 4⅝ per cent. respectively. Why this deliberate mis-statement? Mention is made of the Company's reserve fund and renewals fund, without the information that the former has been reduced and the latter (under £70) has not been added to—apart from accruing interest—since the outbreak of war. Mention is also made of the special purposes fund and the capital redemption fund, without the information that they are non-existent and never existed. These are singular omissions; but they would have found place in an honest report of a real inquiry. Not a word, either, is stated as to the fact that the capital redemption fund was forced on the Company by the Town Council in the House of Commons, and persisted in, in present form, although my Company begged for its alteration when the Bill was in the House of Lords. Round figures are given which suggest that the Company's capital expenditure last December was £428,000. The published accounts show the total capital expenditure was £472,292. I do not realize any purpose in this statement, and hazard the explanation that the demon of inaccuracy ran amok!

"There are other omissions—suppression is the appropriate word—and some of these I supply, with this preface: The report is silent in respect of those larger increases in actual gas sale prices and in percentages which are nigh to universal throughout the country, whether the gas undertaking is municipally or company governed. Most of these increases were made at a relatively early stage of the war. At the close of the year 1913, the Company carried forward undivided profit totalling £3008, and paid dividends at the rate of 5⅞ and 5¾ per cent.; at the close of 1915, the Company had to resort to the reserve fund in order to pay dividends of 5¾ and 5¾ per cent.; and at the end of June, 1916, the Company had further to raid the reserve fund in order to pay dividends of 5 and 4⅝ per cent. An impartial informatory report would have supplied these facts. Why were they suppressed?

"At the close of 1913, the balance carried to profit and loss account was £11,708; in December, 1914, £8709; in December, 1915, £9261; and in June, 1916, £8478 (inclusive of the increased price during the three months). These were inconvenient figures to publish if the object of inquiry was to gather mud to throw at an institution already much maligned. Anyway, they are not mentioned in the report. In the June half year of 1914, the sold gas totalled 209,695,000 cubic feet; and in the June half year of 1916 the sold gas had fallen to 182,172,000

cubic feet. These figures were left out. Had they been mentioned, an acute critic would have suggested the added burden of standing charges on the reduced consumption. In the June half year of 1914, coal, oil, and coke for carbonizing cost £17,284. In the June half year of 1916, the same material cost £22,346; and for these half years sales of gas and rentals aggregated, respectively, £40,651 and £37,699. Suggestive figures these, showing an increase in cost, roughly, of £5000, and a decrease in sales of approximately £3000—together £8000 against the Company on the comparison. These figures were root material for the Committee's inquiry; but nothing is mentioned about them in the report.

"As against this adverse sum of (roughly) £8000, of course there is to be placed the improvement in the price obtained for residuals. These went from £6334 to £9438; but the addition leaves a margin of £5000 (roughly) against the Company. Nothing is said in the report of the fact that the increase in the price of gas was made to meet the rising price of coal—much higher per ton in the first half of 1916 than in the second half of 1915, and still higher in the second half of 1916, as my Directors have already realized.

"There is much more that could be written; but I leave a report, absolutely misleading, by reason of its omission of material facts, with these further statements: My Board welcome honest inquiry, and will reduce the selling price of gas as soon as possible after a sensible reduction takes place in the present high costs of carbonizing and other necessary materials."

The position seems to be that, although coal has gone up 100 per cent., and this one item alone forms 50 per cent. of the Company's expenditure, the price of gas has only been raised, since the outbreak of war, 10 per cent. Thus it is no more than fair for the Company to claim that they have rendered the town some service by not having further increased their price.

FLOODING OF THE SIDMOUTH GAS-WORKS.

Sidmouth had a very unpleasant experience last Friday, owing to the storm which raged along the coast. A strong gale was blowing all night; and about 5 a.m. on the Friday the sea began to break along the whole length of the esplanade, and run down the adjacent streets like rivers. Near the gas-works, a considerable portion of the foreshore was washed away, and the sea poured over into the works. As the natural course for most of the flood water in the town to drain to the river is through the gas-works, the latter were soon flooded to a depth varying from 1 ft. to 2 ft. 6 in. Not many gas managers indulge in sea bathing at this time of the year; and to be wading (as Mr. Henry Burgess, the Engineer and Manager at Sidmouth, had to do) at varying depths almost to the waist at 6.30 a.m., and for several hours, with a strong wind blowing, was not a very enviable position.

The whole of the gas-works were completely under water. There was 12 inches depth of water above the floor of the governor-house, exhauster-house, and retort-house; and the greatest depth was in the coal-stores. The underground tar and liquor storage tanks were covered with water to a depth of 12 inches, and completely filled with sea-water, resulting in considerable loss of ammonia. These tanks had to be pumped down to the level of the separator; and every part of the works and plant required special attention before gas making could be resumed.

It was hopeless to try and cope with the onrush of water. For about five minutes, the chimney looked as if it were extended some 10 feet, as a column of steam ascended, due to the quenching of the fires. Owing to an antiquated seal-pot, the mains were also flooded with water; and later, when one of the syphons was pumped, a miniature fountain rose from the pumping-pipe, as soon as the cap was removed. The oxide in one of the purifiers was soaked; and the purifier will require to be emptied.

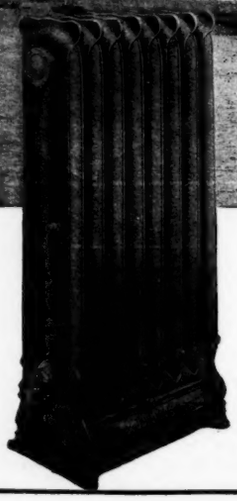
The next tide was almost as bad as the morning one, as the flood reached the level of the retort-house floor; and it was not until 2 a.m. on the following day that the pit for the furnaces could be cleared of water. The local fire-engine was requisitioned to assist the works' pumps. When the furnaces were re-lighted at 2 a.m. on Saturday, the retort-beds were almost black—just a faint colour showing at the top sight-holes. After the water receded, the coke-yard, coal-stores, &c., were covered with a thick coating of reddish brown mud of the consistency of liquid glue.

It was hoped to resume a supply of gas on Sunday night or Monday morning. The storm and consequent flooding were reported to be the worst Sidmouth has experienced within living memory.

Todmorden Trading Accounts.—The abstract of accounts of the Todmorden Corporation undertakings for the year ending March 31 last shows that the gas department had provided a surplus of £932; while the electric undertaking showed a deficit of £1580. The water-works experienced a deficit of £1586.

Birkenhead Wages Award.—Mr. G. J. Carter, who was appointed by the Board of Trade to act as Arbitrator between the Birkenhead Corporation and the gas-workers in a wages dispute, has delivered his award, the main points of which are that the wages of the whole of the men employed at the Corporation Gas Works belonging to the National Union of Gas Workers and General Labourers, and also men doing similar work at the same rate of pay, are to be advanced 3s. per week; the advance to be regarded as war wages, and to be recognized as due to, and dependent upon, all the existing circumstances and the abnormal conditions prevailing in consequence of the war. The yard-men required to go on shift work are to be paid for time work in the yard as well as for the shift work performed, where both are performed within the same day of 24 hours. All the day men required for temporary shift duty are to be guaranteed not less than the ordinary minimum day rate in connection with every shift so worked.

ST. ANDREW GAS-STEAM RADIATORS FOR TEMPORARY HOSPITAL BUILDINGS, &c.



In St. THOMAS' HOSPITAL, London.

130

St. ANDREW RADIATORS ARE IN USE.

EASY TO FIX—Gas connection only required.
EASY TO USE—Gas and Air automatically controlled.
EASY TO CLEAN—No internal tubes or parts.
EASY TO MAINTAIN—No corrosion by gas or water is possible.
EASY TO OBTAIN—All sizes in stock in large quantities.

JOHN WRIGHT & CO., Essex Works, BIRMINGHA M

CEARÁ GAS COMPANY, LIMITED.

A Difficult Year.

The Annual General Meeting of this Company was held last Friday, at the London Offices, No. 9, Queen Street Place, E.C.—Mr. F. A. WALLROTH in the chair.

The SECRETARY (Mr. E. Pratt) read the notice convening the meeting; and the report and accounts were taken as read. The report stated that the result of the working for the year ended June 30 showed a loss of £2536, which, taken from the sum of £5866, the balance from the previous year, left the sum of £3330 to be carried forward. This result had been caused chiefly by the dislocation of business throughout the State of Ceará brought about by the war. The State was now beginning to recover from the results of the drought. Exchange was responsible for a loss of £1751. The Company had been most seriously inconvenienced by the non-payment of the public lighting accounts, which, on June 30, were twelve months in arrear.

The CHAIRMAN, in moving the adoption of the report and accounts, said that the Board were sorry that the results of the year had been so unsatisfactory; but as long as the war went on, he was afraid they could not hope for a much better state of affairs. It was not of much use trying to compare the results of the year under review with those of the previous one, as nearly all materials had been sent out at increased prices. The Company had been seriously inconvenienced by the non-payment of the public lighting accounts. These were now owing for twelve months; and in consequence of the non-payment, the Directors were obliged to call up £2 per share of the uncalled capital in May last, which would not have been necessary had they been able to get payment from the State. He was glad to say the drought in Ceará broke early in the year; and they hoped that a more prosperous time would set in for the State. A new President (Dr. Jōao Thomé de Saboya) had been elected; and he seemed anxious to do what he could to reduce the debt owing to the Company. The shareholders would be interested to know that the claim made against the Municipal Government for the lamp damage in the riots of 1912 had been decided in the Company's favour. Coming to the accounts, there was not much calling for remark. There was £1000 more of capital (owing to the £2 called up); while on the other side the amount due for gas, &c., was now £11,642, or about £350 more than last year. Stocks were nearly £2000 less, goods in transit almost £3000 more, and cash and bills over £3000 less. As regarded the profit and loss account, the result of the year's working was a loss of £2536. Of this, £1750 was caused by loss on exchange, so that the actual loss in working on the year was about £780. All through the year they had only lit one-half of the public lamps; but it was the desire of the Company as soon as possible to resume lighting the whole of them. The receipts on revenue account were £4000 less; the expenses £4000 less. There was only one item to which he wished to allude. The shareholders would see Directors' fees put down at £600, as against £800 for the previous year. At the last meeting, something was said about these fees being paid free of income-tax. The Company voted the Directors the sum of £800, free of income-tax. This was before the income-tax had risen to its present height; and it was suggested that the shareholders had not contemplated such a state of affairs. The Directors promised to take the matter into their consideration, and they had decided for the present to reduce the fees from £800 to £600. There was one more matter to mention; and this was that the contract of the Engineer and Manager (Mr. John Reid) terminated on June 30 last. He did not wish to renew it, and so the Board had appointed an old and tried servant, Mr. W. A. V. Watson, to be his successor. He (the Chairman) desired to take this opportunity of expressing to Mr. Reid the appreciation and thanks of the Directors for the faithful and valuable services he had rendered to the Company during one of the most critical and anxious periods in its history.

Mr. F. W. BROTHERS seconded the motion.

Mr. R. M. LONG asked if there was any reason why the money remaining due on the ordinary shares should not have been paid.

The CHAIRMAN replied that it had not all been called up. There was still £1000 to draw upon.

Mr. F. W. CHURCH said that, under the circumstances existing, he did not see that they could have avoided the loss shown. They all knew that everything used by gas companies had gone up in price—in some cases more than 100 per cent. All the charges on the debit side of the revenue account seemed to have been kept very low. There was, however, an increase of £240 under repairs, &c., of public lamps. With fewer lamps used, he would hardly have expected this. Taking things altogether, the Directors had kept down the charges exceedingly well. To his mind, the *crux* of the whole matter was to be found on the credit side, in the receipts for the gas supplied to public lamps and private consumers. This was £3300 less than for the previous year; while if they compared it with 1914, there was a decrease of £11,000. He was glad to hear the Chairman's appreciative references to Mr. Reid. Certainly, the shareholders were very grateful to the Manager for what he had done, and he would like their thanks to be tendered to him.

The CHAIRMAN pointed out that the item of repairs, &c., of public lamps included mantles, which, of course, had risen greatly in price.

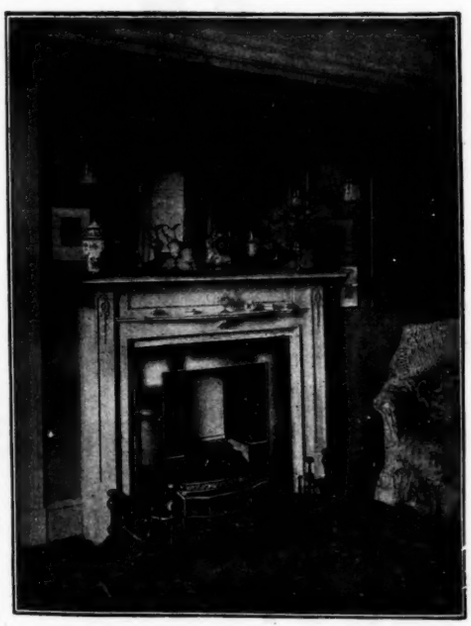
The resolution was then carried unanimously.

The retiring Directors (Mr. F. W. Brothers and Mr. T. M'Making) were then re-appointed, on the proposition of the CHAIRMAN, seconded by Mr. CHARLES WEBB.

Mr. M'MAKING, in returning thanks, said he had been connected with the Company for thirty years—many spent in Ceará; and he could not remember a period of greater difficulties than the past year.

On the motion of Mr. LONG, seconded by Mr. T. A. GUYATT, the Auditor (Mr. W. J. Wright) was re-elected.

The CHAIRMAN proposed a vote of thanks to the Manager and staff



Suitable for use in all Modern Interior Coal Grates.

Artistic Gas Fires.

THERE are many of them, of course, but have you studied the "St. Nicholas" types?

The "St. Nicholas" Gas Fire is a happy combination of the three essentials:

Effective Radiation.
Effective Ventilation.
Effective Appearance.

And the result is *the* Gas Fire.

Low in Price and Easy to Fit.

Designed and constructed by

R. & A. MAIN, LIMITED.

WORKS: Gothic Works, **EDMONTON, N.**; Gothic Ironworks, **FALKIRK**; and Gothic Works, **BIRMINGHAM.**
SHOWROOMS AND BRANCHES: 25, Princes Street, Oxford Circus, W.; 136, Renfield Street, **GLASGOW**; 83, Old Market Street, **BRISTOL**; 18, Severn Street, Deansgate, **MANCHESTER**; 97, Millfield, **BELFAST**; 333, Queen Street, **MELBOURNE**; and 12, Cunningham Lane, Pitt Street, **SYDNEY, N.S.W.**

in Ceará, remarking that they had done their best under very bad conditions, and were entitled to hearty thanks. In Mr. Watson, the new Manager, they had one who had been in Ceará some time in the Company's service, and had been through every department.

Mr. WEBB seconded the proposition, which was cordially agreed to.

The proceedings concluded with a vote of thanks to the Chairman and Directors, proposed by Mr. CHURCH, and seconded by Mr. LONG.

EARLY GAS LIGHTING IN PHILADELPHIA.

In an address to the graduating class of the Franklin Institute School of Mechanic Arts, on a "Century of Light," Mr. Walton Clark, D.Sc. (President of the Institute) said the earliest recorded attempt to provide a gas-works for an American city was made by Dr. Bollman, in Philadelphia, in 1815.

Philadelphia had the first start towards the first American gas-works; but Baltimore and New York had gas-works before Philadelphia. The enterprise of the Italian citizens of Philadelphia, and of Dr. Bollman—indicative each of a progressive spirit in the city—was in contrast to a protest of many prominent citizens, addressed to the Select and Common Councils, and entitled "A Remonstrance against Lighting with Gas." This protest, which was registered in 1883, arraigned gas as a powerful and destructive agent, and the consequences of its use were called "appalling." It concluded: "We earnestly solicit that the lighting of our city with oil may be continued." Among the several hundred signers of this protest were many names well known to-day in Philadelphia business, social, and professional life. But the prominent gentlemen failed of their purpose; and two years later—after Mr. S. V. Merrick had studied gas lighting in Europe, and recommended it to the citizens and government of Philadelphia—Philadelphia established a gas-works, with Mr. John C. Cresson as Engineer. Mr. Merrick was one of the founders of the Franklin Institute, and for twelve years its President. Mr. Cresson, the builder of the first gas-works in Philadelphia, was at that time one of the managers of the Franklin Institute, and later, for eight years, its President.

Lighting at Padiham.—At the monthly meeting of the Padiham Urban District Council, Mr. Russell (the Chairman of the Gas Committee, and Secretary to the Local Weavers' Association) hinted that there was a feeling among the cotton operatives that there must be better street lighting over the winter, or they would have to consider whether they should refuse to work during certain hours. The Gas Committee were given power to act. It was pointed out that there was mechanism at the works for controlling the lights, and the members failed to see why the street-lamps should not be lighted and the mills fully lit up.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Oct.* 30.

Though there is little to report in the London tar products market, it may be said that pitch is steady at 21s. net per ton f.o.b. makers' works for export, and that creosote is firm at 3⅞d. to 4d. net per gallon. It appears also that the creosote price throughout the Provinces has become quite firm, and the value advanced to near the London level. Other products are unchanged.

Sulphate of ammonia is steady, and the export quotation remains at £17 12s. 6d. net per ton into buyers' bags, *ex* makers' works, for 25 per cent. quality.

Tar Products in the Provinces.

Oct. 30.

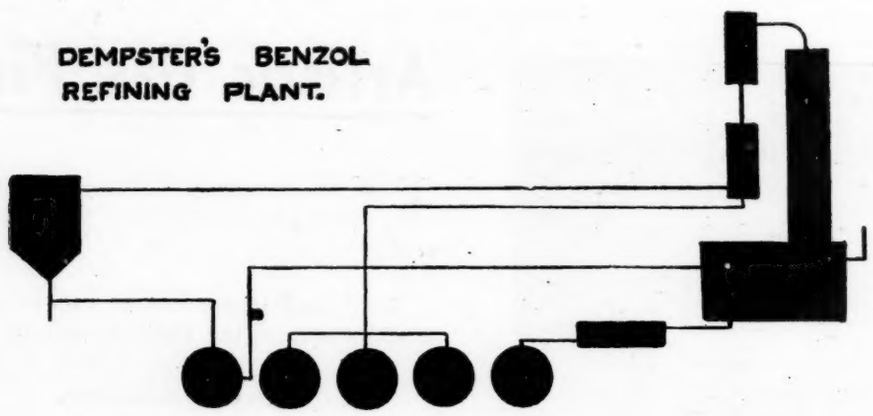
The market for tar products remains about the same, with the exception of creosote, which seems to have improved slightly. There appears to be a little more solvent naphtha offering; but the price remains steady. Business in pitch is still very difficult, as the freight question hinders business to a very great extent.

The average values of gas-works products during the past week were: Gas-works coal tar, 17s. to 21s. Pitch, East Coast, 16s. to 16s. 6d. per ton; West Coast—Manchester 15s. to 15s. 6d., Liverpool 16s. to 16s. 6d., Clyde 17s. to 18s. Benzol, 90 per cent., North, 10½d. to 11½d.; 50-90 per cent., naked, North, 1s. 3d. to 1s. 4d. Toluol, naked, North, 2s. 3d. Coal tar crude naphtha, in bulk, North, 6½d. to 6⅝d. Solvent naphtha, naked, North, 1s. 10d. to 1s. 11d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, 2½d. to 2⅝d. Heavy oils, in bulk, North, 3⅛d. to 3¼d. Carbolic acid, 60 per cent., East and West Coasts, 3s. 4d. naked. Naphthalene salts, 70s. to 80s., bags included. Anthracene, "A" quality, 2½d. to 2⅝d. per unit; "B" nominally ¾d.

Sulphate of Ammonia in the Provinces.

LIVERPOOL, *Oct.* 28.

During the past week permission to make shipments to neutral countries has been granted by the War Trade Department for a considerable quantity of this material, and this fact has caused a further advance in prices. The nearest values at the close are £17 17s. 6d. per ton f.o.b. Hull, £18 f.o.b. Liverpool, and £18 2s. 6d. f.o.b. Leith. Owing to the uncertainty of the outlook in the forward position, neither buyers nor sellers have shown much disposition to commit themselves; but a few more transactions have been reported at 2s. 6d. to 5s. per ton above prompt values.



DEMPSTER'S BENZOL REFINING STILLS

AT THE PRESENT TIME ARE PRODUCING

100,000 GALLONS

OF REFINED PRODUCTS PER DAY.

R. & J. DEMPSTER, LTD. MANCHESTER.

Nitrate of Soda.

There has not been any change in this market, and holders on spot still require 17s. 7½d. per cwt. for ordinary quality, and 18s. 1½d. for refined.

Sulphate of Ammonia.

From another source it is stated that quotations for this article remain about the same. Outside London prices, £16 15s.; Hull, £17 12s. 6d.; Leith, £17 17s. 6d.; Liverpool, £17 15s.; Middlesbrough, £17 12s. 6d.

COAL TRADE REPORT.

Northern Coal Trade.

The coal trade is decidedly easier because of the limited supply of tonnage at the coal ports, and also because of the dislocation caused by the extension of the "controlled" prices and freights. There have been fewer arrivals of steamers. Some cargoes of coal are thus thrown on the market; and prices taken for such fuel have been lower for several classes of coal. In time the market will adjust itself to the new conditions; and it is probable that the lower prices at which coal may then be delivered will enlarge the demand for fuel for Italy, as it has for France. In the steam coal trade, the owners of ready tonnage have been able to buy best steam coals at 30s. per ton f.o.b.; and from this to 33s. may be taken as the current quotations, though some sales at higher prices are reported. Second-class steams are from 28s. per ton; and steam smalls are plentiful at from 18s. to 23s. Gas coals are irregular in price—about 31s. per ton f.o.b. for best Durhams, 22s. to 23s. for seconds, while for "Wear specials" about 33s. is the figure. Prices, however, are fluctuating a good deal—the extensions of the scheduled price to the Mediterranean ports, accompanied with the retention of the old prices under contracts, making it rather more difficult to decide as to how far the market quotations now prevail. In one way the gas coal trade may be affected—the rates of freight to Italy are much lower under the "schedule" than they have been; and that country is a large buyer from us of gas coal, which will now cost less delivered there. Freights to London are firm, on the basis of 12s. from the Tyne, while for coke they are stronger. Coke itself is more plentiful, but is well taken up. Good gas coke is quoted from 33s. 6d. to 35s. per ton f.o.b. in the Tyne. The latest figure reported for the freight on coke from the Tyne to Dunkirk is 41s. 3d.

Mr. C. H. Carder, of Oldbury, the Gas Engineer, is taking a leading part in the formation of a Volunteer Corps for the district, in connection with which movement an excellent start has been made. For some time, Mr. Carder has been a member of the Dudley Volunteer Corps.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Oct. 25.]

Nos. 14,649—15,017.

Bench, T. C.—"Gas rings or burners for heating." No. 14,882.
Butler, J. B.—"Controlling temperature of fluids." No. 14,700.
Charles, C. H.—See Bench. No. 14,882.
Conley, J. L.—"Means for screening lights at desired times." No. 14,789.
Crump, G. L.—"Manufacture of thorium nitrate." No. 14,937.
Green, H.—See Conley. No. 14,789.
Harrison, H.—"Economizers for gas cooking stoves." No. 14,932.
Helps, G.—"Gas manufacture." No. 14,750.
Kay, J. H.—"Coal-gas making apparatus." No. 14,857.
Keymer, R. R.—"Shades for lights in buildings." No. 14,665.
Mead, A.—"Gas-heated furnace, &c." No. 14,864.
Murphy, J.—"Rod for upright mantles." No. 14,651.
Ross, J. S.—See Crump. No. 14,937.

Restoration of Lapsed Patent.

Notice is given that an order has been made restoring the letters patent granted to Charles Ridley for an invention entitled "Improvements in the methods of obtaining gases from solids," No. 15,000 of 1908, bearing date July 15.

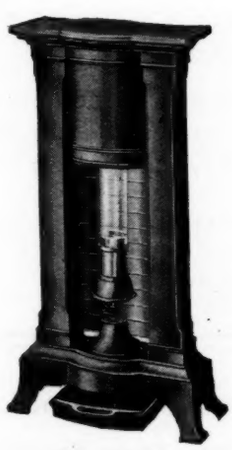
This month's registrations at Somerset House include Southey Gas Producers, Limited, with a capital of £30,000 in £1 shares.

The Directors of Meters Limited, of Manchester, being of opinion that the profits of the Company during the past half year warrant the payment of interim dividends to Sept. 30, at their meeting last week declared the following on account of the dividends for the current year: On the preference shares at the rate of 5½ per cent. per annum, and on the ordinary shares at the rate of 4 per cent. per annum.

The Horseley Company, Limited, have issued a chart, prepared by Mr. Daly, to illustrate the advantage which might be derived by advancing the date on which the Daylight Saving Act comes into operation by another month—April, instead of May. After carefully considering the subject, Mr. Daly concludes that further economy might be effected by the adjustment of working hours during the first three and the last three months in each year. In the case of firms working overtime—say, up to 9 p.m.—there is seen to be a decided advantage in the matter of light-saving as the summer period advances. The chart also shows that an economy would be effected by starting the working day at 7 a.m. in the months of February, March, October, November, and December. This has been tried on what is known as the "one-break" system, with working hours from 7 a.m. to 12 noon, and from 1 p.m. to 5.30 p.m. for five days per week, and on Saturday from 7 a.m. to noon—giving a total of 52½ hours per week.

Clark's Flueless Heating Stove

The extraordinary popularity of Clark's Syphon Stove is due to these advanced working principles:—



The Phœnix.

Made in TWO Sizes for Immediate delivery.

Its scientific method of generating Pure Heat under all conditions.

Its silent burning, and warm, cheerful effect.

Its simplicity in fixing; no chimney outlet is required and it can be placed anywhere.

Its low working and maintenance charges; its great efficiency and the full complement of designs for all styles of furnishing and decoration.

These features have secured its adoption not only by the civic population, but also by the military authorities, where it is doing good service in Military Hospitals, Convalescent Homes, Training Camps, etc.

Clark's Syphon Stove Co., Ltd.,

132, Queen Victoria Street, London, E.C.

Works: Warrington, Lancs.

Slough Gas Company.

The report adopted at the half-yearly meeting of the Slough Gas Company stated that, notwithstanding the increase in the cost of all materials and labour, the result of the operations has been satisfactory; and so far the Company have been able to carry on their business without making any further increase in the price of gas. The Directors recommend the payment of a dividend at the rate of 6 per cent. per annum on the ordinary stock, and 5 per cent. per annum on the preference stock—both less income-tax. The Chairman (Mr. R. V. Elvey) remarked that the shareholders would see from the balance-sheet that at the present moment the Company were holding an enormous stock of coal. Never in the history of the concern since he had been connected with it had they held such a large stock. This, of course, locked up a good deal of capital; but owing to difficulties of transit and other causes, it would be rash not to guard themselves thoroughly against the supply being cut off. Therefore they had so provided that if their coal was entirely cut off for some months, they would still be able to carry on the business. Of course, when they wanted to make extensions and lay new mains, there was the difficulty of getting materials. They would have to pay 100 per cent. more than before the war. They had had a very satisfactory half year in the production of gas, the amount per ton of coal carbonized being a record. It was very good the previous half year, but the total this time was well over 12,000 cubic feet per ton. They had also erected at the works a dehydrating and distilling plant for the tar. If they had not done this, they would not have been able to get the good price which was obtained for the tar. Having their dehydrating plant ready in time, they had been able to meet the demands of all local authorities for tar, which was a very good thing for themselves. The Directors were very pleased indeed with the work done by their Engineer and Manager (Mr. H. Wilkinson) with regard not only to the erection of this plant, but also for many other things; and he complimented Mr. Wilkinson on his exceedingly good work. They were getting a very fair price not only for tar, but also for light oils from the tar. Business had been quiet during the half year; but they had gained 98 slot consumers. If they could only deal with it, they would have a largely increased demand for gas-fires this autumn.

Church Fire through a Fusing Wire.—During service at Holy Trinity Church, Woolwich, last Sunday week, a fire broke out under the floor in the gallery, owing to the fusing of an electric wire. The fire brigade were, however, fortunately, promptly in attendance, and the fire was extinguished with little damage.

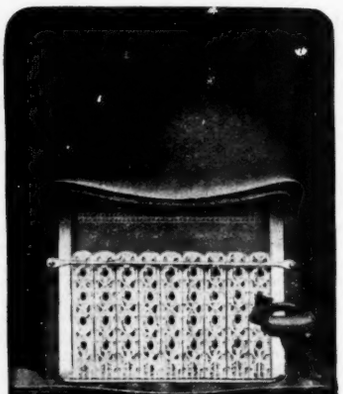
Military Representative and Gas Making.—At the last meeting of the Hebden Bridge Military Tribunal, the Manager of the Hebden Bridge and Mytholmroyd Gas-Works (Mr. T. H. Nield) appeared to support an appeal for exemption for a stoker at the works. He said that the man had only been passed for Home Service; and he therefore pressed the case. They had lost so many men that it was quite clear that if the staff was any further reduced, he would have no option but to reduce the pressure on the mains. He had vacancies for several men. The man was given conditional exemption. At a subsequent local Tribunal, the Military Representative advised a man with a large family to get employment at the gas-works. To another man he remarked that, if he secured work at the gas-works, he would consider it as of "national importance."

Lighting Restrictions in Manchester.—A scheme has been arranged by the Chief Constable of Manchester and the Chief Gas Engineer (Mr. J. G. Newbigging) for carrying out the instructions of the Home Office on the matter of restricted public lighting. The main points are: (1) That no gas-lamps be lit in the side streets or other similar places in the city except danger places. (2) In the main thoroughfares one lamp in three be lit, and such lamps be properly shaded below the mantle. (3) Gas-lamps in the centre of the city to be lit only until 6.30 p.m. (4) All gas-lamps to be extinguished within ten minutes from the time a message is received "to take air-raid action." (5) Such extinguished gas-lamps to remain out till daybreak. (6) At each of the 25 police stations in the city two lamplighters are to be stationed for the purpose of extinguishing lamps in case of a raid.

Local Government Board and Corporation Allowances.—The Manchester Corporation have been informed by the Local Government Board that they adhere to their decision that in no case must the allowance by the Corporation to the wives or other dependants of Corporation employees now with the Colours cause the man's income to go beyond 25 per cent. over his civil pay. Originally, the Corporation allowed to each man one-half his former wages or salary, and when this was stopped, and the Local Government Board said the aggregate emoluments must not be more than 25 per cent. over a man's former pay, the City Council pleaded that the restriction should not apply to persons whose former wages were not more than 40s. a week. At a meeting of the Parliamentary Committee last week, however, it was stated that a letter had been received from the Local Government Board adhering to their formerly expressed decision.

Hornsey Public Lighting Charge.—At a meeting of the Hornsey Town Council, it was reported that a letter had been received from the Engineer to the Gas Company (Mr. J. W. Buckley) stating that, while the price of gas for public lighting had been maintained at 2s. 1½d. per 1000 cubic feet from 1907 to 1915, the net cost of manufacture had ranged from about that figure to the present cost of 2s. 5½d. Under the Hornsey Gas Act, 1916, the price to be charged by the Company to the Corporation for a period of ten years from the passing of the Act is the net cost of manufacture. It was suggested by the Company that the revised price of 2s. 5½d. should obtain as from next Christmas quarter; but as the estimates for the ensuing half-year's expenditure had been passed by the Council, they assented to the increase being deferred until after the end of the March quarter, 1917. The proposed alteration in price will result in an estimated annual increased expenditure of £208, on the basis of the present reduced lighting, or £430 on the full lighting. The Highways and Lighting Committee reported having given instructions for inquiry to be made as to the way in which the net cost of manufacture of the gas is ascertained.

PARKINSON
Gas Fires



"RATCLIFF" & "EDMUND."

TWO styles that may well be classed together, as the wearing parts are identical and interchangeable. The "Ratcliff" has, however, a rounded top.

The removable Side Boiling Burner shown can be fitted to either style and is easily removed.

Both are fitted with "Intense" Pillar-Fuel, gas-air adjuster, Rectangular Flue Outlet, and (specially to be noted) fenders that cover all brass-work.

Of unobtrusive yet pleasing design, they represent a high standard for moderately priced fires.

Specially selected for "The Lancet" tests and pronounced to be hygienically perfect (Nov. 14th, 1914).

Book of the "Ratcliff" and "Edmund" Fires will be sent post free.

The Parkinson Stove Co. Ltd.

Birmingham . Stour Street, Spring Hill.

London . . 129 High Holborn, W.C.

Tottenham and the Calorific Standard.—The Public Health Committee of the Tottenham Urban District Council report that their Parliamentary Agents have lodged objections to the application of the Tottenham Light, Heat, and Power Company for an Order under the Gas (Standard of Calorific Power) Act, 1916.

Wages of Birmingham Corporation Employees.—The Labour Committee of the Birmingham City Council have resolved to refer to the Board of Trade for arbitration the application of the Amalgamated Society of Gas, Municipal, and General Workers for an increase of 1s. per day, or 6s. per week, in the wages of the Corporation workmen. This step meets with the approval of the representatives of the men's Society. The trading departments of the Corporation are certified under the Munitions Act, which provides that any dispute or apprehended dispute between employers and workmen shall be referred to the Board of Trade. Consequently, as the Labour Committee were reluctant to break the agreement entered into with the Corporation workmen in February last, when the men were granted a war bonus of 2s. per week, "as a final general settlement of wages during the war," and the present application might have involved a dispute, they were persuaded that the best course to take was to appeal to an independent tribunal.

Price of Gas at Hinckley.—At a meeting of the Hinckley Urban District Council, Mr. Bott said the works were well supplied with coal, but at a very high price. The Council were in a fortunate position. Up and down the country, the price of gas had been increased far in excess of Hinckley, where the advance had only so far been 2d. per 1000 cubic feet. They could not say whether a further advance would be necessary; but it was satisfactory to know that up to the present they had been able to manage without it.

Stockton Gas-Works Extensions.—At a special meeting of the Stockton Corporation, the Gas Committee asked for confirmation of a scheme for extending the plant at the gas-works, to cost £1770. The Council unanimously approved the scheme; but a long discussion took place on a proposal of the Committee that the entire cost should be paid out of the current year's revenue. In favour of this, it was stated that one-half the cost would be recouped in profit in the year, and a 1d. rate would cover the remainder. Mr. Nattrass (the Chairman of the Finance Committee) said the Gas Committee had already estimated they would have a deficit on the financial year of £82. He moved, as an amendment, that the money be borrowed in the usual way. There were 14 votes for the amendment, and 15 for the Gas Committee's recommendation, which was accordingly carried.

STOCK MARKET REPORT.

THERE is no improvement on the Stock Exchange to report. The general condition of markets is the same as it was last week and the week before that. They are for the most part dull and dispirited, and disagreeably quiet; and the operating factors remain much the same, too.

We noted last week the formidable competition of the double-gilt attractions of 6 per cent. Exchequer Bonds and the French Loan. These influences were again in full swing, drawing away a mint of money that Capel Court could have done with very well. Then another lever of some potency was furnished by the war news. On the Western front, almost as a matter of course, it was all that could be desired; but in the East the retirement of the Roumanians in the Dobrudja was less satisfying. So, as often before, the investing public concluded to "wait and see."

Government issues were irregular. Weak at first, they brightened up on Wednesday at Verdun news, and, after another reaction, closed better. Home Rails were very quiet, with little movement. Americans were better; and Canadians revived on the labour settlement—if surrender can be called a settlement.

The Foreign Market was mostly dull. Brazilians advanced on improved prospects; but other South Americans, and even Japanese, lacked strength. Argentines were flat, and South Africans recoiled from recent advances. In the Miscellaneous group, the majority of movements were adverse. Rubber and Oil were irregular and mostly dull, and textiles and war industries in general were not in such good request as heretofore.

Business in the Gas Market was again on a very restricted scale; and the general tone was dull and inanimate. Gas Light ordinary furnished only nine transactions in the whole week, and South Metropolitan only one. Luckily, some half-a-score of bargains were done in a few of the Suburban and Provincial group, which are not often in evidence, or the array would have been meagre indeed. With a few exceptions, the tendency of prices was downward, much the same as other markets. [*Erratum*, in last week's article, "for *four* undertakings were dealt in" read *eight*.] In the Money Market, a strong demand developed in mid-week; but the close was easier. Discount was firm.

Bargains done for cash during the week were as follows: On Monday, Gas Light ordinary 76⅛, 77, 77⅛, 77⅜, Portsea "B" 91½, 92, ditto "C" 89, 89½, Primitiva 4½s. 6d., San Paulo debentures 40½, 40¾. On Tuesday, Commercial 4 per cent. 73½, Croydon "C" 173, 174, European 12⅝, 12¾, Gas Light ordinary 76⅛, 77, ditto maximum 55, Portsea "B" 95⅛, South Metropolitan 84½, South Suburban 80⅝, 81, Wimbledon 90, 90½. On Wednesday, Commercial 4 per cent. 73½, 74, Gas Light maximum 57, ditto preference 69, 70, 70⅛, Imperial Continental 87, 87¼, Portsea "B" 95, Primitiva 67s. 6d. On Thursday, Brentford "A" 86, 86½, Gas Light ordinary 76½, 76⅝, ditto maximum 57, ditto debenture 59½, Imperial Continental 87, Newcastle 30, Portsea "A" 98, 98½. On Friday, Gas Light Ordinary 77, 77¼, Imperial Continental 85, Primitiva 42s. 6d., Tottenham "A" 120.

The Bank rate is 6 per cent.—as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Previous Div or Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices. July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
175,472	Stk.	Mar. 10	4	4%	Aldershot 4 p.c. Pref.	..	65—70	..
1,551,868	"	April 8	2½	5%	Alliance & Dublin Ord.	59—64	62—64	..
874,000	"	July 10	4	4%	Do. 4 p.c. Deb.	76—79	60—65	..
280,000	5	April 29	7½	4/6	Bombay, Ltd.	5½—6⅜	4⅞—5⅛*	..
50,000	10	Feb. 26	16	15/-	Bournemouth Gas and Water { 10 p.c.	29—30	26—27	..
338,110	10	"	7	7/-	B 7 p.c.	15—15½	11—11½	..
115,000	10	"	6	6/-	Pref. 6 p.c.	13½—14	9½—10	
159,740	—	—	—	4%	4 p.c. Deb.	..	73—75	..
992,045	Stk.	Feb. 26	†14	55/-	Brentford A Consold.	261—266	86—88	87—86½
734,920	"	"	†11	53/9	Do. B New	204—209	83—85	..
55,000	"	"	5	5%	Do. 5 p.c. Pref.	109—111	85—90	..
221,400	"	June 11	4	4%	Do. 4 p.c. Deb.	91—93	..	..
217,880	Stk.	Feb. 26	11	10⅝%	Brighton & Hove Orig.	208—213	165—168	..
244,200	"	"	8	7¾%	Do. A Ord. Stk.	154—159	121—124	..
530,000	20	Mar. 26	12½	22/6	British	44—45	34—35	..
120,000	Stk.	June 26	4	4%	Do. 4 p.c. Deb. Stk.	88—90	68—70	..
345,771	Stk.	June 26	4	4%	Buenos Ayres 4 p.c. Deb.	85—87	60—65	..
100,000	10	—	—	—	Cape Town & Dis., Ltd.	1½—2½	1½—1⅝	..
100,000	10	—	—	4½%	Do. 4½ p.c. Pref.	4—6	4½—5	..
100,000	Stk.	June 26	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	60—65	..
157,150	Stk.	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	85—86	..
1,518,280	Stk.	Feb. 12	5/9/4	49/4	Commercial 4 p.c. Stk.	106—108	72—74	73½—74
560,000	"	"	5½	46/8	Do. 3½ p.c. do.	103—105	68—70	..
475,000	"	June 11	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—57	..
800 000	Stk.	"	4	—	Continental Union, Ltd.	76—79	36—38	..
200 000	"	"	7	—	Do. 7 p.c. Pref.	115—118	55—57	..
278,400	—	—	—	11¼%	Croydon B and C 7 p.c.	..	175—185	178—174
—	—	—	—	10%	Do. E	..	..	..
492,270	Stk.	—	6	5½%	Derby Con. Stk.	128—135	100—105	..
55,000	"	—	4	4%	Do. Deb. Stk.	102—104	80—83	..
1,002,180	10	July 29	10	7/6	European, Ltd.	17½—18	12½—13½	12⅝—12⅞
16,318,430	Stk.	Feb. 10	4/17/4	42/-	Gas Light and Coke { 4 p.c. Ord.	98—102	76½—77½	76½—77⅛
2,600,000	"	"	3½	3½%	3½ p.c. max.	76—79	55—58	56—57
4,062,235	"	"	4	4%	4 p.c. Con. Pref.	96—99	69—71	69—70½
4,674,850	"	June 11	3	3%	3 p.c. Con. Deb.	72½—74½	59—61	59½
180,000	"	"	10	10%	10 p.c. Bonds	..	..	..
258,740	Stk.	Mar. 12	5	4½%	Hastings & St. L. 3½ p.c.	87—89	78—83	..
70,000	10	April 29	11	6%	Hongkong & China, Ltd.	16½—16⅞	8—9	..
96,600	—	—	—	9%	Hornsey 7 p.c.	..	125—135	..
181,000	Stk.	Mar. 12	7½	7½%	Ilford A and C	151—154	119—117	..
65,780	"	"	6⅜	6¼%	Do. B	116—119	103—108	..
55,500	"	June 26	4	4%	Do. 4 p.c. Deb.	92—94	73—76	..
4,940,000	Stk.	May 14	9	4½%	Imperial Continental	150—160	85 90	85—87½
1,235,000	Stk.	Feb. 12	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	65—67	..
235,249	Stk.	Mar. 12	6½	6¼%	Lea Bridge Ord. 5 p.c.	112—121	87—92	..
2,493,905	Stk.	Feb. 26	10	5%	Liverpool 5 p.c. Ord. { A	211—218	87—88	..
						146—148		..
806,083	"	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	..	76½—78½	..
75,000	5	June 11	6	2/-	Malta & Mediterranean	4½—4⅝	4—4½	..
250,000	100	April 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	92—101	89—93	..
541,920	20	May 26	4	6/-	Monte Video, Ltd.	11½—12	8¾—9½	..
1,575,892	Stk.	July 29	4½	4½%	Newc'tle&G'tesh'd Con.	98½—99½	79½—80½	80
539,705	Stk.	June 26	3½	3½%	Do. 3½ p.c. Deb.	82—83	75—77	..
55,940	10	Feb. 26	7/14/0	7/8/8	North Middlesex 7 p.c.	14—15	10½—11½	..
800,000	Stk.	May 14	8	8%	Oriental, Ltd.	117—122	108—110	..
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd.	7⅜—7⅝	2—3	..
50,000	50	Feb. 26	13	13%	Portsea, Island B	128—131	95—100	91½—95½
100,000	50	"	12	11%	Do. C	118—121	88—93	89—89½
52,000	50	"	10	9%	Do. D	..	..	..
249,980	5	April 29	8	—	Primitiva Ord.	5⅛—6	2 1/16—2 3/16	42/6—44/6
499,960	5	June 26	5	2/6	" 5 p.c. Pref.	4¾—5	3⅛—3½	67/6
521,600	100	June 2	4	4%	" 4 p.c. Deb.	91—98	80—82	..
—	—	—	—	4%	" " 1911	..	..	..
846,198	Stk.	June 26	4	4%	River Plate 4 p.c. Deb.	85—87	63—68	..
150,000	10	May 14	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	8—8½	..
125,000	50	July 1	5	5%	5 p.c. Deb.	47—49	43—45	40½—40½
135,000	Stk.	Mar. 12	10	10%	Sheffield A	223—224	188—192	..
209,984	"	"	10	10%	Do. B	222—224	188—192	..
533,500	"	"	10	10%	Do. C	220—222	188—192	..
90,000	10	May 26	9	6/-	South African	10½—11½	..	..
6,609,895	Stk.	Feb. 10	5/4/0	44/-	South Met., 4 p.c. Ord.	111—113	83—85	84½
1,895,445	"	July 10	3	3%	Do. 3 p.c. Deb.	72½—74½	59—61	..
224,830	Stk.	Feb. 26	8½	8%	South Shields Con. Stk.	157—159	145—147	..
962,795	Stk.	Feb. 26	6	48/4	S'th Suburb'n Ord. 5 p.c.	114—116	80—82	80½—81
60,000	"	"	6	6%	Do. 5 p.c. Pref.	110—119	79—81	..
135,000	—	—	—	48/4	Do. West Kent.	..	..	..
187,558	"	June 26	5	5%	Do. 5 p.c. Deb. Stk.	116—118	90—92	..
647,740	Stk.	May 14	5	5%	Southampton Ord.	99—102	90—95	..
120,000	Stk.	Feb. 12	7½	7½%	Tottenham { A 5 p.c.	135—138	120—123	120
782,275	"	"	6	5⅞%	District { B 3½ p.c.	115—117	90—92	..
181,255	"	June 26	4	4%	4 p.c. Deb.	87—89	73—75	..
183,380	10	Dec. 30	5	—	Tuscan, Ltd.	5—6	1—2	..
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	60—65	..
226,476	Stk.	Mar. 12	5	5%	Tynemouth, 5 p.c. max.	108½—109½	91—92	..
					Wandsworth, Wimbledon, and Epsom—			
90,000	Stk.	Feb. 26	8⅜	78/9	Wandsworth A 5 p.c.	151—156	117—122	..
255,686	"	"	6⅜	63/9	" B 3½ p.c.	129—134	101—103	..
108,075	"	"	5/17/8	55/1½	" C 3½ p.c.	110—115	88—93	..
363,000	"	"	6¼	67/6	Wimbledon 5 p.c.	117—122	90—95	—93
98,000	"	"	6⅜	63/9	Epsom 5 p.c.	131—136	98—103	..
88,416	"	June 26	5	5%	3 p.c. Deb. Stk.	56—59	53—56	..

* Ex. div. † Paid on Old 10 p.c. and 7 p.c. Standard Stocks.

Edinburgh Public Lighting.—The Convener of the Cleaning and Lighting Committee of the Edinburgh Town Council (Bailie Stark) reported recently that a number of experiments with the pressure-wave system for automatically lighting and extinguishing the public lamps had been made, and that they had been successful. He had arranged for the Committee to witness last week an exhibition of the system in a part of the city where about eighty lamps have been fitted with the apparatus. If the scheme is applied to the lamps generally, it will place the gas-lighted areas on the same footing as those lit by electricity, and so enable the lamps to be quickly extinguished in the event of an intimation of an air-raid. Bailie Stark deserves great credit for the keen interest he has taken in this subject.

The South African Lighting Association, Limited, of Port Elizabeth and Grahamstown, are issuing convincing coke literature to householders, together with some useful instructions as to the use of this excellent form of fuel in domestic grates and kitchen ranges.

Several children have been burnt to death at Middlesbrough recently through the careless practice of parents in using gas-rings on the floor. The most recent victim was a girl aged 5, whose flannelette nightdress became ignited at an unguarded ring on the ground.

The Highways Committee of the Lewisham Borough Council report, with reference to the increase of 15 per cent. on the schedule of prices for the reinstatement of trenches opened under statutory powers, that all the authorities concerned have agreed to the increased scale.

It is reported that an agreement has recently been entered into by the National Chamber Oven Company of Cincinnati, the Stacey Brothers Gas Construction Company of Cincinnati, and the Russell Engineering Company of St. Louis, under the terms of which the Companies will, in future, co-operate in the sale and construction of National chamber oven plants in the United States, Canada, and Mexico.

At a Woolwich inquest, it was stated that the wife of a man into whose death the inquiry was held [a retired assistant foreman at the Arsenal] went out about mid-day, and on returning in the evening proceeded to his bedroom and struck a match. An explosion occurred, and she was burned about the head and neck. Her husband was afterwards found dead in bed. A gas-tap in the room was turned on; but no evidence was forthcoming as to how this came to be so. A doctor stated that the man's death must have occurred before the explosion as the result of suffocation from coal gas. Evidence was given that deceased had nothing to worry him except ill-health; and an open verdict was returned.

A United Kingdom firm of manufacturers' agents, with a branch at Sydney, desires to represent in Australia United Kingdom manufacturers of (among other goods) gas-meters and fittings. Manufacturers may obtain the name and address of the inquirers on application to the Department of Commercial Intelligence, 73, Basinghall Street, E.C. —quoting No. 376.

Experience in Sheffield shows that, by substituting tar macadam for water-bound, not only do the public get far superior roads, free from mud in winter and comparatively free from dust in summer, but also that, although such roads are subject to an increasing amount of motor traffic, they are cheaper to maintain than were the same roads under horse traffic when made in the old way.

At the annual meeting of the Glenboig Union Fire-Clay Company, the Chairman (Mr. James Dunnachie) said that there was every reason to be satisfied with the result of the year's working. They had been successful in getting a sufficient number of men released to enable them to carry on work fully. Wages and cost of fuel, which had been greatly increased, were their principal items of expenditure; but they had been able to meet the increase by higher prices. The Government had now fixed the prices for fire-bricks for England and Scotland; and the Glenboig prices were the highest. In reply to a question, the Chairman said the Directors had not thought it necessary to put anything to reserve this year. A shareholder remarked that the sum of £149,164 set aside for depreciation was a reserve of a very tangible nature; and Mr. H. Morgan added that £18,000 in reserve, and the sum of £5000 written-off for depreciation this year, and repairs and renewals paid out of revenue to the amount of £6970, surely made sufficient provision. A dividend at the rate of 20 per cent. per annum was declared.

NEWSPAPERS FOR NEUTRAL COUNTRIES.

The Secretary of the War Office has issued the following order:

> The public are informed that newspapers and other printed publications will not be sent to Neutral European Countries unless posted direct from the office of publishers or newsagents who have obtained permission from the War Office for this purpose. Persons desiring to send newspapers, &c., to Neutral European Countries should, therefore, give their orders for execution to publishers or newsagents who have obtained such permission.

The Publisher of the "JOURNAL" has obtained the required permission of the War Office; and he will, on receipt of instructions, forward copies direct from the office to any neutral country.

WANTED, FOR SALE, CONTRACTS, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Appointments, &c., Vacant.

CARBONIZING SUPERINTENDENT. No. 6234.

DRAUGHTSMAN. No. 6236.

CHARGE OF SUCTION GAS, &c., PLANT, &c. Oxford Cold Storage and Ice Company.

WORKS CHEMIST. No. 6237.

ASSISTANT WORKS FOREMAN. Northampton Gaslight Company.

GAS FITTER. Haverhill Gas Department.

FOREMAN PLUMBER. Sheffield Water-Works.

Appointment Wanted.

MANAGERIAL OR SECRETARIAL POSITION, &c. No. 6229.

Plant, &c. (Second-Hand) For Sale.

BOILER TANK, STEAM WAGGONS, TRACTION, &c. Stanley Engineering Company, Bath.

PIPES, &c. No. 6236.

Wanted to Purchase.

CARBON. No. 6192.

Stocks and Shares for Sale.

GRAYS AND TILBURY GAS COMPANY. Tenders by Nov. 9.

OXIDE OF IRON.

O'NEILL'S OXIDE
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

SPENT OXIDE PURCHASED IN ANY DISTRICT.

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for Gas-Works.
ANDREW STEPHENSON, Gresham House, Old Broad Street, LONDON, E.C. "Volcanism, London."

HYDRATED OXIDE OF IRON.

FOR SALE—
LARGE QUANTITIES OF THE ABOVE.

INQUIRIES INVITED.

THE THERMO ELECTRIC ORE REDUCTION CORPORATION, LIMITED,
HIGH TOWN, LUTON.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, London, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams—
"BRADDOCK, OLDHAM," and "METRIQUE, LAMB LONDON."

SEND your inquiries for Carburetted HYDROGEN AND BLUE WATER-GAS PLANT, also TAR DEHYDRATING PLANT and other GAS-WORKS APPARATUS to—

BALE AND HARDY,
89, VICTORIA STREET, WESTMINSTER, S.W.

"FERROX." "FERROX." "FERROX."
A BRITISH Oxide Cheaper and Better than Bogore. 35 per cent. Water, 75 per cent. Ferric Hydrate. For Sale outright or on Loan.
OXIDE LIMITED, Brentford, MIDDLESEX.

J. E. C. LORD, Ship Canal Tar-Works, Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

OXIDE OF IRON.
We are in a position to Supply Oxide of Iron promptly, and invite Enquiries.
SPENT OXIDE WANTED.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"TORTO" FIRE CEMENT.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

"KLEENOFF," THE COOKER CLEANSER.
Tins for sale to Consumers.
In Bulk for Works Use.
BALE & CHURCH, LTD.
5, CROOKED LANE, LONDON, E.C.

SULPHURIC ACID.

SPECIALLY prepared for the manufacture of SULPHATE OF AMMONIA.
SPENCER CHAPMAN & MESSEL, LTD.,
with which is amalgamated WM. PEARCE & SONS, LTD.,
86, Mark Lane, LONDON, E.C. Works—SILVERTOWN.
Telegrams—"HYDROCHLORIC, FEN. LONDON."
Telephone—1586 AVENUE (3 lines).